

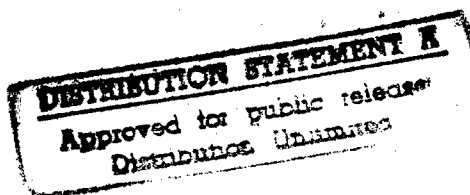
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USSR Report

ELECTRONICS AND ELECTRICAL ENGINEERING



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ELECTRONICS AND ELECTRICAL ENGINEERING

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ROUNDING NOISE IN M-STAGE RECURSIVE DIGITAL FILTER

Moscow RADIOTEKHNIKA in Russian No 7, Jul 86
(manuscript received after revision 17 Dec 85) pp 10-15

[Article by V.A. Geranin, L.I. Kotlyar, and P.A. Markelov]

[Abstract] Noise at the output of an M-stage recursive digital filter caused by rounding the results of arithmetic operations with a floating decimal point, results of additions and multiplications, is analyzed starting with the difference equation for the i -th stage of an ideal biquadratic array. In the direct configuration of a real biquadratic array the response of the i -th filter stage with a transfer function $H_i(z) = B_i(z)A_i^{-1}(z)$ ($B_i(z)$ - transfer function of nonrecursive part, $A_i^{-1}(z)$ - transfer function of recursive part, $i = 1, \dots, M$) is treated as the response of a recursive digital filter with a transfer function $A_i^{-1}(z)$ to white sieve noise. In the canonical configuration of a real biquadratic array noise in both parts is also shown to be equivalent to white sieve noise. The dispersion of the rounding error is calculated accordingly, whereupon is determined the number of digits in the mantissa in the summators necessary for not exceeding the allowable dispersion. Figures 4; references: 2 Russian.

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UTILIZATION OF NONGAUSSIAN NATURE OF CLUTTER IN OPTIMIZATION OF DEVICES FOR POSTDETECTION INTERPERIOD COMPENSATION

Moscow RADIOTEKHNIKA in Russian No 7, Jul 86
(manuscript received after revision 8 Feb 86) pp 51-54

[Article by A.Z. Kiselev]

[Abstract] Square-law interperiod compensation of noncoherent moving-target selection is optimized by utilizing the non-Gaussian nature of clutter, the additional compensation being effected after detection. In a plain compensator the linear channels are weighted according to a priori differences between useful signal level and interference signal level. In a more elaborate compensator the channels have been grouped for larger and smaller a priori differences. The feasibility of using small-signal channels for additional interference rejection from strong-signal channels is established on the basis of corresponding correlation functions and the signal processing algorithm. An optimum compensator is defined with respect to the ratio $k = \Delta^2/D_0$ as criterion (Δ - difference between mathematical expectations of compensator signal in presence and absence of useful signal, D_0 - dispersion of mathematical expectations in absence of useful signal). Such a compensator is evaluated and, for comparison, also a Gaussian one. Figures 4; references: 4 Russian.

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ALGORITHM OF SPACE PROCESSING OF SIGNALS AND INTERFERENCE FOR ELECTROMAGNETIC COMPATIBILITY

Moscow RADIOTEKHNIKA in Russian No 7, Jul 86
(manuscript received after revision 28 Nov 85) pp 54-56

[Article by A.P. Rodimov, V.V. Nikitchenko, and L.M. Kononov]

[Abstract] A method of space-processing of signals and interference is proposed which ensures interference immunity by widening the interference spectrum and thus lowering the interference level. It also eliminates conventional frequency processing. For demonstration, the method is applied in the transmitter of a radio communication system operating with space-phase keyed signals and directional antennas. The algorithm of such processing ensures electromagnetic compatibility in the system, is extremely simple to execute, is invariant with respect to interference modes, and is very efficient in operation with narrowband signals at moderate interference levels. Figures 2; references 3: 2 Russian, 1 Western.

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POLYMODEL APPROXIMATION OF SIGNAL AND INTERFERENCE DISTRIBUTIONS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 86
(manuscript received after revision 1 Nov 85) pp 56-59

[Article by V.Ya. Kontorovich]

[Abstract] Polymodel approximation of functions which describe distributions of signal and interference is analyzed for adequacy, specifically in common real situations where the interference mode changes sharply during the period of complete signal reception. Typical such situations are lumped keyed interference and switching of interference sources. The analysis is based on the theory of variable states, with a random structure describable by a system of stochastic differential equations as model of interference in a channel. The corresponding Fokker-Planck-Kolmogorov equation is formulated and solved for a uniform probability density of a state, assuming a Poisson distribution of time intervals between state changes. The order of the approximation error is estimated for a system of particular equations describing a particular interference mode and found to be equal to the reciprocal of the correlation interval for the first approximation. References: 4 Russian.

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OPTIMIZATION OF SPACE-TIME PROCESSING ALGORITHMS FOR RADIO SIGNALS

Moscow RADIOTEKHNIKA in Russian No 4, Apr 86
(manuscript received after revision 12 Nov 85) pp 3-7

[Article by A.S. Bogachev]

[Abstract] In order to construct practical optimal signal processing algorithms for such applications as radars, where the signals reflect the configuration of the antenna array, the observation vector is represented as a set of subvectors, each of which includes the signals from the array elements for one particular measurement. In a planar array, the observation vector can be broken down into subvectors formed by the signals from the array row and column elements; the aggregate of information and accompanying parameters forming the state vector is frequently also divided in this fashion. This approach is employed in processing the returns from an extended radar target represented as an aggregate of speckle points. The variables of state (coordinates, their derivatives and other parameters) associated with these points must be incorporated in the state subvectors, where the points are distinguished by a single spatial coordinate. This paper derives quasioptimal algorithms for nonlinear

continuous filtering in a gaussian approximation as applied to such space-time radar signal processing against the background of the internal noise of the antenna array receiving elements, a characteristic feature of which is the above breakdown of the state and observation vectors into subvectors of definite dimensions. This approach takes into account the specific aspects of the aggregate of estimated parameters and the reception of the returns in the general case of a multidimensional antenna array. The matrix analysis of the partial differential equations generates analytical expressions for estimating the vector of state and the covariation matrix of the filtering errors when two and three-dimensional arrays are used. No sample calculations or design examples are given. References: 7 Russian.

8225/9835

CSO: 1860/270

UDC 621.396.019.4

SYNTHESIS OF DEVICES FOR OPTIMAL PROCESSING OF RADIO PULSE SIGNALS IN
LONG-RANGE RADIO NAVIGATION SYSTEMS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 86
(manuscript received after revision 16 Dec 85) pp 16-19

[Article by P.P. Filatov]

[Abstract] A receiver of radio pulse signals for long-range radio navigation systems, optimum with respect to both accuracy and interference immunity, is synthesized in accordance with the Markov theory of optimal nonlinear discrete-analog filtration for minimum fadeout. Calculations are based on a model of such a system and its operation which adequately describes the state vector, with inclusion of singularities resulting from time discretization of continuous navigation parameters. The receiver is accordingly a nonlinear filter consisting of an estimator of state vector components, an optimum multidimensional discriminator, and a phase-lock automatic frequency control, with amplifier stages providing the necessary gain and cross-coupling. There are two channels for estimating the signal amplitude in the master station and in the follower station respectively. Performance characteristics with typical numerical data are shown based on solution of the two equations of a posteriori second central moments. Figures 3; references: 6 Russian.

2415/9835
CSO: 1860/23

SPECTRAL ANALYSIS OF SIGNALS ON BASIS OF FAST FOURIER TRANSFORMATION

Moscow RADIOTEKHNIKA in Russian No 7, Jul 86
(manuscript received 12 Nov 85) pp 49-50

[Article by A.V. Andriyanov]

[Abstract] Spectral analysis of periodic discrete signals on the basis of fast Fourier transformation is proposed, with interpolation of one signal period to a given analysis interval not necessarily a multiple of that period. The error caused by initial and final jumps of signal level is eliminated by first determining the length of the signal period in discretization intervals NT and then determining the discretization interval necessary for representing the signal period in terms of M points $T_0 = NT/M$. The signal levels at all points M are calculated, with linear or cubic interpolation, whereupon the algorithm of fast Fourier transformation is executed. The interpolation error is estimated according to Newton's formula. This method can be used only when the analysis interval is not shorter than one signal period. For illustration, a discrete Fourier transformation with $M = 256$ points was applied to a harmonic signal after interpolation at $N = 8$ and $N = 64$ points. Tables 1; references: 1 Czechoslovak.

2415/9835
CSO: 1860/23

MEASURING INSTRUMENTS FOR RADIO NAVIGATION BASED ON SERIES K588 MICROPROCESSOR SETS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 86 (manuscript received after revision 29 Oct 85) pp 77-80

[Article by G.N. Gromov, V.V. Gavrishchuk, R.V. Drozdov, Yu.T. Krivoruchko, B.V. Ponomarenko, and L.I. Chukanov]

[Abstract] Modern scanning and tracking on-board instruments for radio navigation are built on the basis of microprocessor sets, 16-bit microprocessors being most satisfactory for this application and compatibility of 16-bit microcomputers with a family of minicomputers facilitating standardization. These instruments generally operate according to Markov's theory of optimal nonlinear filtration. Their structure includes a composite memory array and a preprocessor consisting of a data converter-limiter, a state word register, a program exchange and interruption controller, a direct access to memory controller, a digital-exchange module, and an analog-signal module. Series 588 microprocessor sets have hardware and software compatible

with various microcomputers such as Elektronika-60 or Elektronika-NTs-80-01 and software also compatible SM minicomputers. They have a modular architecture with intermodular links through parallel interfaces, they are asynchronous and microprogrammable. They are now built with 8 large-scale-integration chips, but there is flexibility for expansion. The software is for LORAN-A, DME, TACAN systems (U.S.) or RSBN, RMS systems (Soviet) with radio altimeters and Doppler speed-and-drift meters. Figures 1; references: 14 Russian.

2415/9835
CSO: 1860/23

UDC 621.39 .67.01

INFLUENCE OF SHIP'S METAL STRUCTURES ON ANTENNA PERFORMANCE

Moscow RADIOTEKHNIKA in Russian No 4, Apr 86
(manuscript received 3 Aug 85) pp 86-88

[Article by M.V. Vershkov and B.M. Levin]

[Abstract] The directional patterns of shipboard antenna systems are influenced considerably by a ship's metal superstructures. In the HF marine bands, the metal structures can be replaced for analytical purposes by an equivalent system of thin conductors. Assuming that the radii of the conductors are small as compared to the wavelength, there is no need to idealize the shapes of the superstructures, thus enabling the numerical computation of the effect of these structures on antenna patterns. The number of model conductors simulating a structure must be chosen so that the spacing between them is no more than 0.08 wavelengths. The computational procedure is illustrated with the derivation of the pattern of a whip antenna mounted above the bridge of a Pobeda type tanker and Tatarstan motorship for operation at 6 and 12 MHz. The input impedance and the directional gain at frequencies of 6.5 and 12.5 MHz are shown for both types of ships as well as for free space. Experimental and calculated values are in good agreement. The authors are grateful to O.M. Aladko for assisting in the calculations. Figures 2; references 6: 4 Russian, 2 Western.

8225/9835
CSO: 1860/270

SIGNAL PROCESSING IN MULTIPOSITIONAL RADAR SYSTEMS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 86 (manuscript received after revision 26 Nov 85) pp 46-49

[Article by V.M. Petrov and T.G. Vyatkina]

[Abstract] Signal processing in multipositional coherent radar systems with wide diversity of receivers and with phased antenna arrays on each is analyzed, considering the possibility of effective interference suppression. A quasi-optimum algorithm of space-time processing is constructed by separation of intrapositional and interpositional processing so that processing within each antenna array is matched and interference from other antenna arrays can be ignored. This algorithm is technically much easier to execute than the optimum algorithm of lumping all antenna arrays into a rarefied single one. The procedure is demonstrated on a system consisting of one transmitter and N receivers, with interference coming from an external point source of stationary noise and an internal source of intrinsic receiver noise. Signal processing in each receiver is first assumed to be matched and optimal in the absence of external interference sources. An analysis of the resulting performance characteristics indicates that, with the proper number and spacing of receivers, adequate directivity of their antennas and sufficiently low side lobe levels in their radiation patterns, this algorithm is almost as efficient as the optimum one. Figures 3; references: 2 Russian.

2415/9835

CSO: 1860/23

DISTORTIONS OF WIDEBAND SIGNALS IN ANTENNA-RECEIVER SYSTEM DUE TO SPACE-FREQUENCY FLUCTUATIONS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 86 pp 65-67

[Annotation of article No 791 deposited at Central Scientific and Technical Institute Informsvyaz, 15 pp with 10 bibliographical references]

[Article by V.B. Fortes]

[Abstract] Considering that space-frequency distortions of signals in antenna-receiver systems can be caused either by random reflector manufacturing errors and resulting deviations of the receiver transfer function from the optimum one or by fluctuations of the incident field, general expressions are analytically derived which relate the statistical characteristics of fluctuations at the receiver output to those of input signals or those of antenna parameters. Wideband signals with uniform Gaussian spectral density are assumed to propagate through a homogeneous medium and to arrive at the antenna covering its aperture with a uniform Gaussian distribution. Those expressions reveal that increasing the antenna dimensions will reduce the signal waveform distortions, which has been confirmed experimentally by measurements in tropospheric channels.

2415/9835

CSO: 1860/23

SUPPRESSION OF FIRST SIDE LOBES IN APERTURE ANTENNAS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 86
(manuscript received after revision 19 Feb 86) pp 80-85

[Article by Yu.A. Yerukhimovich and I.L. Nepomnyashchiy]

[Abstract] A device has been proposed earlier for suppression of the first side lobes in the radiation pattern of an aperture antenna such as an ADE two-reflector antenna with an offset paraboloidal main reflector and an ellipsoidal auxiliary reflector in the fourth point of a two-frequency four-point radio relay system. This device, two dielectric prisms placed apart in the antenna aperture and effecting a partial wavefront rotation, can be improved by use of a dielectric lens with triangular section and rectangular base on a straight parallelepipedal mount instead. Design and performance calculations based on antenna and field theory, for typically a quadratic amplitude profile in the antenna aperture, demonstrate that part of a plane wavefront is rotated into alignment with directions $\pm\theta_1$ of maximum radiation intensity in the two first side lobes, while the

mount produces an additional phase shift so as to minimize the loss of gain in the major lobe. Such a lens with mount was tested experimentally in an ADE antenna operating in the 40 GHz frequency band with an aperture 175 mm in diameter and with a circular shadow at the center covering 2% of the aperture area. Figures 4; references: 4 Russian.

2415/9835
CSO: 1860/23

UDC 621.372

DESIGN FEATURES OF ANTENNAS WITH MAGNETIC TAPE CORES

Moscow RADIOTEKHNIKA in Russian No 7, Jul 86 (manuscript received after revision 3 Mar 86) pp 85-86

[Article by A.M. Donets and V.N. Fedosov]

[Abstract] Expressions for calculating the inductance of coils wound on tape cores are derived, useful for design and performance optimization of magnetic antennas. The core material is assumed to have a relative magnetic permeability higher than 10^5 so that the lateral edge effect does not significantly distort the induced magnetization distribution in a uniform longitudinal magnetic field. The tape is assumed to be wide and have the shape of approximately a prolate elliptical cylinder, which facilitates an analytical solution of the field problem. The magnetic field intensity at points inside the core near a turn of the excitation coil or the measuring coil wound with flat conductors is obtained from the vector potential and expressed in terms of the MacDonald function.

2415/9835
CSO: 1860/23

UDC 621.396.75

BOUNDARY CONDITIONS FOR IMPEDANCE STRUCTURES CONSISTING OF REACTIVELY LOADED TAPE LINE SEGMENTS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 86 (manuscript received after revision 10 Feb 86) pp 89-91

[Article by O.N. Tereshin, V.D. Dvurechenskiy, V.I. Mishin, and A.S. Kuskov]

[Abstract] Impedance structures consisting of infinitesimally thin tape lines with equidistant reactive load inserts are considered for shaping the electromagnetic field distribution at some surface within the antenna-feeder

system. The boundary conditions for such structures are continuous tangential component of the electric field intensity. An impedance structure consisting of reactively loaded straight tape segments periodically spaced on any surface, plane or cylindrical, and with a short circuit at one end each is shown to provide a broad versatility in terms of attainable electromagnetic field distributions with a continuous Poynting vector at the surface of such a structure. The boundary conditions for such a structure, derived from the solution to corresponding circuit equations for three admittances, define the relation between its electrical and design parameters. Figures 2; references: 1 Russian.

2415/9835
CSO: 1860/23

UDC 551.521.3:551.593.52

RESULTS OF MEASURING OPTICAL THICKNESS OF ATMOSPHERE AT LINES OF OZONE'S ROTATIONAL SPECTRUM

Moscow RADIOTEKHNIKA in Russian No 7, Jul 86 (manuscript received 14 Feb 86)
pp 92-93

[Article by Yu.Yu. Kulikov and V.G. Ryskin]

[Abstract] Propagation of millimetric and submillimetric radio waves through the terrestrial atmosphere is significantly influenced by its ozone, a variable component. The polyatomic O₃-molecule behaves like an asymmetric spinning top with a dense rotational spectrum and with a vibrational ground state including approximately 745 lines within the millimetric-submillimetric range, which limits the choice of Earth-Space channels. The optical thickness of the atmosphere was measured at two ozone lines with resonance frequencies of 142,175.1 MHz and 101,736.76 MHz respectively. They were made with two multichannel spectrum analyzers, one for the 110-150 GHz band and one for the 80-110 GHz band, also using a CAMAC crate and an ELEKTRONIKA-60 microcomputer for automation. They were made in April 1983 near Alma Ata at 3000 m above sea level and in February-March in Gorkiy. The results indicate an approximately 30% widening of the lines since previous measurements made in 1979 and thus a redistribution of ozone over a 30-50 km high atmospheric layer during the intervening period of time. Figures 3; references 7: 4 Russian, 3 Western.

2415/9835
CSO: 1860/23

STATISTICAL ANALYSIS OF ANTENNA SYSTEM PARAMETERS BASED ON FIELD SPECIFIED AT SPHERICAL SURFACE

Moscow RADIOTEKHNIKA in Russian No 4, Apr 86 (manuscript received after revision 10 Jun 85) pp 81-83

[Article by N.N. Aleshkevich, M.A. Vilkotskiy, and A.P. Grinchuk]

[Abstract] Changes in the far field parameters of antennas can be predicted from the field statistics at some surface in the near field. Since the enclosures for large antenna systems are usually spherical, a spherical system of coordinates is best for such analyses. This paper is a theoretical and experimental study of antenna systems in the case when the inhomogeneity statistics are specified at a spherical surface encompassing the antenna. Expressions are given for the antenna gain, the directional gain, the cross and primary polarization patterns, the dispersions of these patterns and the dispersion of the directional and total system gain. The application of these analytical expressions was checked experimentally using the model of a spherical diffraction shell and direct far and near-field measurements. With a sufficiently large spherical surface radius and small errors, the errors in calculating the primary parameters using the adduced formulas does not exceed 25% as compared to the statistical reduction of the set of direct measurement data for the far field. The average values are calculated more precisely than the dispersion (by 5 to 15%). Tables 2; figures 2; references 2: 1 Russian, 1 Western.

8225/9835

CSO: 1860/270

GAIN OF STANDARD RADAR INTERMEDIATE FREQUENCY AMPLIFIER

Moscow RADIOTEKHNIKA in Russian No 4, Apr 86 (manuscript received 17 Aug 85) pp 92-94

[Article by Ye.S. Dmitriyevskiy, O.I. Illarionov, A.P. Kuteynikov, and L.I. Smirnova]

[Abstract] Seven samples of a standard 20 MHz IF amplifier (a three stage transistor design) were subjected to long term testing in order to determine the change in the gain as a function of time. The initial scatter in the parameters of the sample amplifiers was reduced by carefully selecting the components: the transistors were gain matched within 1% and the remaining components were matched within 0.1%. Four of the amplifiers were tested at 130°C and three at 70°C ($\pm 1^\circ\text{C}$). The change in the gain is plotted as a

function of time out to 1,500 hours. The trend line of the gain variation for the first 750 hours is generally of a nonmonotonic, decreasing nature; this is apparently explained by the relatively rapid irreversible changes in the component parameters due to the initial exposure of their organic materials to heat. Beyond 700 hours, the change in the gain is due primarily to the thermal ageing of the components. Simple empirical expressions are given for the gain as a function of time for the two groups of samples. Figures 4; references: 2 Russian.

8225/9835
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UDC 537.874.4.001.24

SCATTERING OF WAVES ON IDEALLY CONDUCTING AND IMPEDANCE BODIES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 31, No 7, Jul 86
(manuscript received 19 Nov 85) pp 1265-1275

[Article by Ya.N. Fel]

[Abstract] A study is made of a system of ideally conducting bodies which is struck by a wave excited by defined sources consisting of electric and magnetic currents which are considered to be distributed within a volume located outside the bodies. A method is suggested for calculating the scattering of waves on the bodies, as well as bodies with impedance under heterogeneous and anisotropic boundary conditions. The Fourier coefficients are determined for the density of the real or equivalent current on the surfaces of the bodies. The currents and the scattered fields they excite are determined. Figures 3; references: 8 Russian.

6508/9835
CSO: 1860/9

UDC 621.396.677.85

MIRROR ANTENNAS-ABERRATION CRITERIA, SCANNING LIMITS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 31, No 7, Jul 86
(manuscript received 22 Oct 84) pp 1276-1284

[Article by V.K. Bodulinski, B.Ye. Kinber, and B.I. Romanoba]

[Abstract] This work, which continues a previously published work, introduces a physically reasonable criterion for determination of the optimal trajectory of a radiator and estimate of scanning sector boundaries, estimates that variation in scanning sector as a function of reflector system

geometry and wavelength, then finally compares three types of mirror antennas: bifocal, Cassegrain and Schwarzschild. The possibility of decreasing aberrations in the scanning sector by selecting the surface filling law between reference points of a bifocal system is studied. Figures 7; references: 4 Russian.

6508/9835
CSO: 1860/9

UDC 550.388.01

DISTRIBUTION OF AMPLITUDES OF ATMOSPHERICS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 31, No 7, Jul 86
(manuscript received after revision 2 Jul 85) pp 1332-1335

[Article by Ye.A. Vershinin, I.G.V. Skrebtsov and D.S. Dobryak]

[Abstract] A discussion is presented of the maximum absolute value of the quasi-oscillation process which generates VLF atmospheric or the peak value of an atmospheric, referred to as its amplitude. The discussion is based on extensive experimental material produced by the authors, which confirms the applicability of the log-normal rule to the distribution of atmospheric amplitudes at the reception point. Examples are presented from experimentation with a field measurement system which recorded the amplitudes of atmospheric directly. Figures 1; references 18: 10 Russian, 8 Western.

6508/9835
CSO: 1860/9

UDC 621.391.82.01

OPTIMAL PROCESSING OF VECTOR OPTICAL FIELD WITH ATMOSPHERIC DISTORTIONS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 31, No 7, Jul 86
(manuscript received 5 Jan 85) pp 1336-1343

[Article by P.A. Bakut, A.L. Voldrov and Yu.A. Zimin]

[Abstract] Optimal processing for a vector field reflected from an object and exposed to a turbulent atmosphere is determined. The combined amplitude of the vector optical field is analyzed in the plane of the aperture of a receiving optical system assuming the object studied to be within the limits of the zone of isoplanatism of distortions and the effect of the turbulent atmosphere to be scalar. Phase distortions are analyzed, since they have the primary influence on the propagating field. It is

demonstrated that the processing of the vector field may differ significantly from the processing of the field in the scalar approximation, allowing extraction of additional information from the field. Figures 4; references: 6 Russian.

6508/9835
CSO: 1860/9

UDC 621.371.029.65:621.396.96

INFLUENCE OF CHAOTIC SURFACE IRREGULARITIES ON REFLECTED MILLIMETER WAVE PULSE SIGNAL

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 31, No 7, Jul 86
(manuscript received after revision 16 Apr 85) pp 1405-1414

[Article by G.A. Andreyev and A.A. Potapov]

[Abstract] The space-time frequency correlation functions of reflected millimeter wave pulses are computed, pulse length is estimated as a function of ground cover relief and antenna orientation, properties of reflected pulse signals are studied as functions of surface type, effective scattering area of the ground surface is determined, seasonal variation in effective scattering area is studied and experimental data from studies on scattering of millimeter waves from aircraft are compared with theoretical calculations. The experimental wavelength was 8.6 mm. The studies covered 8 types of ground cover. Based on the equations derived for the space-time frequency correlation function, the variation in millimeter wave pulse length reflected from a chaotic ground cover as a function of random irregularities, antenna orientation and radiation pattern width is established. Experimental data illustrate the relationship between the millimeter wave pulse envelope and ground cover type. An appendix illustrates determination of the space-time frequency correlation function of millimeter waves scattered by an extended chaotic surface. Figures 5; references 19: 18 Russian, 1 Western.

6508/9835
CSO: 1860/9

FAST OSCILLATIONS OF OSCILLATION PARAMETERS, METHOD OF AVERAGING AN ANALYTIC SIGNAL

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 31, No 7, Jul 86
(manuscript received 20 Jun 85) pp 1459-1462

[Article by D.Ye. Vakman]

[Abstract] A study is made of narrow band oscillations in a fixed frequency band around a known central frequency. The problem is to determine the frequency band which contains the spectrum of quadrature components. It is found that an improved first approximation is but a somewhat artificial method of replacing oscillating parameters with low-frequency parameters. An improved approximation is unnecessary, since application of an equation presented in this article and averaging provide satisfactory results. References: 12 Russian.

6508/9835
CSO: 1860/9

UNIVERSALITY OF METHOD OF TRANSFORMING ATMOSPHERIC RADIO NOISE DISTRIBUTION FUNCTION FROM BAND TO BAND USING SUMMARY EMPIRICAL MODEL

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 31, No 7, Jul 86
(manuscript received 11 May 85) pp 1462-1463

[Article by V.F. Osinin]

[Abstract] The purpose of this work is to show that a method of transforming the distribution function of atmospheric radio noise from band to band suggested in a previous work by the author is broadly general and can be utilized where $x \neq 1$. The simple analytic method developed in the earlier work for transforming the distribution function of atmospheric radio noise from band to band using a summary empirical model is shown to have universal properties, so that it can be equally used with an increase or decrease in the transmission band of the receiving apparatus. Figures 1; references 8; 6 Russian, 2 Western.

6508/9835
CSO: 1860/9

UDC 621.397.13:659.2

HIGH PERFORMANCE AUDIOVISUAL REFERENCE INFORMATION TELEVISION SYSTEM

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 7, Jul 86 pp 15-18

[Article by S.V. Novakovskiy and I.R. Mamedov, Moscow Electrical Engineering Institute for Communications]

[Abstract] Reference information TV transmission systems (such as Teletext and Antiope) can utilize the standard 8 MHz TV channels allocated by a municipality or region for broadcasting during hours when the regular programs are not aired. This paper proposes a Soviet counterpart of the Antiope system with substantially better specifications than the latter. The bit noise immunity in the low speed pages is 254 times greater than in the Antiope system; the number of such pages per complete journal is increased from 100 with Antiope to 254 for the proposed system. The accompanying audio is transmitted for each low speed page, thus increasing the volume of information and reducing the harmful impact of image errors. The time needed to transmit a single high speed page is 163 times less in the Soviet system (1.536 ms) and the number of such pages is 12.5 times greater. The total number of transmitted pages is 1,504 in the new design. The parameters of the proposed supplemental information transmission system are summarized in tabular form: single image page transmission time is 0.25 s; 24,571 bits/s transmission rate with a single bit pulse width of 40.6 microseconds. The transmission of such teletext in a USSR standard video signal during the frame blanking pulse means that lines 16 to 21 or 329 to 334 can be used for this purpose. The supplemental information signals in each scan field are represented by one or two pulse packets containing this information in encoded form. Each packet occupies the single line allocated to it. A block diagram shows the insertion of the video and audio in the TV carrier as well as the waveform of the high speed pulse packet and the digitization of the original audio signal for each low speed page. While detailed specifications are proposed, no hardware or design examples are shown. Figures 4; references: 3 Russian.

8225/9835

CSO: 1860/320

SERVICE LIFE AND WEAR PARAMETERS OF VIDEO RECORDER HEADS

Moscow TEKHNICA KINO I TELEVIDENIYA in Russian No 7, Jul 86 pp 19-23

[Article by N.M. Yeremin, M.I. Afrin, and A.N. Litunenکو]

[Abstract] While the service life of video recorder heads in the general case is a function of many parameters (head material, type of tape, head/tape pressure, humidity, ambient temperature, dust in the environment, tape transport mechanism tension, etc.), this paper details the experimental data on head wear, considering only the type of tape, changes in tape abrasiveness and the head to tape pressure (the other parameters are nearly constant over the experiment). The video head wear in micrometers is plotted as a function of the number of passes of the magnetic tape for Scotch-400, T4403-50, Ampex-175 and T4411-50. The change in the recording current, the playback e.m.f. and signal to noise ratio is also plotted as a function of the size of the working gap; these and other data are analyzed using an equivalent circuit for the video heads in order to specifically determine the change in the equivalent circuit parameters as a function of the wear and come up with the best recommendations for extending head life. The equivalent inductance connected to the recording amplifier output changes by 0.24 microhenries (by 8%) when the working gap changes by 40 micrometers. During six playback passes, the equivalent inductance changes by 3.75 microhenries (by 33%). Since the equivalent capacitance is about the same for the record and playback channels, the impact of an inductance change on the frequency response is most apparent in the playback channel. The influence of the equivalent inductance change depends on the particular circuit designs of the recording and playback amplifiers. When designing digital video recorders (requiring a sharp increase in the record density), attention must be devoted to the change in head inductance at the low frequency and of the signal spectrum during the wear process, since a pulse code modulated signal has a greater degree of energy saturation at the low frequencies than the FM signal used in present analog recorders. Figures 7; references 8: 7 Russian, 1 Western (in Russian translation).

8225/9835

CSO: 1860/320

LASER VIDEO DISK PLAYER

Moscow TEKHNIIKA KINO I TELEVIDENIYA in Russian No 7, Jul 86 pp 23-27

[Article by V.I. Butta, V.L. Vasilishin, V.S. Gvozdikov, A.P. Doygan, M.I. Drobot, G.P. Korniyenko, I.M. Senko, and A.I. Ektov]

[Abstract] The new Soviet Amfiton-501 Video compact laser disk player uses a hard video disk with an outside diameter of 305 mm and an inside diameter of 33 mm. The recording area represents approximately 90 mm over the disk radius and contains about 50,000 helical turns, corresponding to a playback time of 30 minutes on one side (data capacity of about 2 Gbytes). A 1.5 mW He-Ne laser produces an approximately one micrometer spot on the disk surface. The video channel bandwidth is 5.5 MHz; the audio response is 30 Hz to 15 kHz; the signal to noise ratio at the video output is 40 dB; the disk turns at 1,500 r.p.m. and the power consumption of the unit is 90 W. The player has five playback modes including stop-frame and fast forward and backward search as well as display of the playback frame number on the TV screen. This paper also discusses the various automatic control systems for disk and head travel. Figures 2; references 11: 6 Russian, 5 Western (3 in Russian translation).

8225/9835

CSO: 1860/320

UDC 778.24:778.417

RASTER AND PRISM-GENERATED THREE-DIMENSIONAL IMAGE SCREEN

Moscow TEKHNIIKA KINO I TELEVIDENIYA in Russian No 7, Jul 86 pp 27-28

[Article by N.K. Ignatyev and S.I. Kosodurov, All-Union Scientific Research Institute for Motion Picture Photography]

[Abstract] A reflective raster three-dimensional image screen can be produced by the plastic formation of flat mirror elements on the surface of metal blank when the normals of the resulting elements are directed towards a single orthocenter. With an average distance of r_{avg} from the orthocenter to the blank, a reflective raster system is formed with optical properties close to a spherical mirror of radius r_{avg} and focal distance of $r_{avg}/2$. This raster, three-dimensional image screen is a discretely constructed optical surface having a small enough divergence of the outgoing elementary rays that a three-dimensional image can be reconstructed in the near-screen space. The image is usually projected onto such a screen from a distance close to r_{avg} . This paper describes a transillumination variant of such screens when prisms rather than mirrors are used. The inclined faces of the prisms also have their normals directed to a single orthocenter at r_{avg} from

the base plane of the screen. The optical geometry of such systems is discussed and photographs show the angular scattering function for fragments of mirror and prismatic screens. The essentially qualitative discussion provides neither design equations nor examples of hardware. Figures 2; references: 5 Russian.

8225/9835
CSO: 1860/320

UDC 681.84.083.84+681.841.2

NEW INSTRUMENTATION MAGNETIC RECORDING TAPES

Moscow TEKHNICA KINO I TELEVIDENIYA in Russian No 7, Jul 86 pp 39-40

[Article by N.S. Kovalevskaya, All-Union Scientific Research Institute for Motion Pictures and Photography]

[Abstract] The audio recording laboratory of the All-Union Scientific Research Institute for Motion Pictures and Photography developed and placed in series production at motion picture duplicating plants the following new recording tapes during the 11th Five-Year Plan: 35LIM3-MCh magnetic, multifrequency sound recording 35 mm tapes (technical specification TU 19-562-85); the 35 mm and 70 mm 35LIM3-3-Sh-23 and 70LIM3-Sh audio instrumentation tapes with three-octave and broadband pink noise recording capability; the 35 mm and 70 mm music and speech recording tape 35MRM-KL and 70MRM-KL. The first two groups of instrumentation tapes are manufactured at the Kharkov motion picture duplicating plant and the third group is manufactured at the Kiev plant. Typical specifications are (35LIM3-MCh): nominal tape transport speed is 456 mm/s with one recording track; recording time constant of 35 microseconds; inclination angle of the magnetic lines relative to the direction of tape travel is $90^\circ \pm 3'$, with a recording track width of 23 ± 0.1 mm; the sine wave magnetization level (1,000 Hz \pm 3%) for checking and setting the nominal output level is 320 ± 15 nWb/m. Figures 3.

8225/9835
CSO: 1860/320

NEW LINE OF LARGE APERTURE OBJECTIVE LENSES FOR WIDE FORMAT FILM PHOTOGRAPHY

Moscow TEKNIKA KINO I TELEVIDENIYA in Russian No 7, Jul 86 pp 29-31

[Article by A.B. Agurok, T.A. Kaganova, I.G. Neginskaya, I.V. Nikandrova, E.I. Teryayeva, and L.L. Firsova, Ekran Scientific Production Association, Central Design Office for Motion Picture Photography]

[Abstract] Four new lenses for 70-mm motion picture film were developed in 1985 by the Ekran Scientific Production Association, Central Design Office for Motion Picture Photography. The four objectives (OKS8-40-1, OKS7-56-1, OKS16-75-1 and OKS10-100-1) have been recommended for series production after successful prototype film testing by Mosfilm, Lenfilm and the Motion Picture Studio imeni A.P. Dovzhenko. Their focal distances range from 40.7 to 99.8 mm with F-stops of 1:2 to 1:1.4, angular fields of view are 72° to 32°; their weights range from 0.4 to 0.84 kg, lengths from 51 to 91 mm and maximum diameters of 56.5 to 90 mm. Other specifications are detailed in a table and drawings show the configuration and optical geometry of the lenses. Themodulation transfer functions of the lenses are also graphed for the meridional and sagittal sections (for the OKS8-40-1 and OKS10-100-1). These new designs produce higher contrast images and significantly reduce light scattering in the lenses. Figures 4; references: 3 Russian.

8225/9835

CSO: 1860/320

FLAT TELEVISION SCREEN USING ARRAYS OF LIGHT EMITTING DIODES

Moscow RADIOTEKNIKA in Russian No 4, Apr 86 (manuscript received after revision 9 Dec 85) pp 37-39

[Article by N.P. Ionov, B.V. Kazakov, and M.N. Platonov]

[Abstract] A TV screen was constructed from 128x128 image elements; such a screen displays every other line of the field of the 625-line broadcast TV standard. Red LED's with a maximum at 655 nm were used in 16 matrices, with each matrix containing 32x32 emitters having a spacing between the elements of 600 micrometers. The arrays were fabricated using planar epitaxial technology and the area of an emitting element was $4 \cdot 10^{-4} \text{ cm}^2$. The relative emission efficiency of an individual element was no less than 10 microcd/mA (a minimum relative brightness of 250 cd/m²·mA). The maximum pulsed brightness of the LED's did not permit the successive reproduction of each of the image elements as in kinescope devices. The screen was 78x78 mm with a maximum brightness of 30 cd/m² and a contrast of 30:1. The device had 64 brightness quantization levels and a clear image could be seen when

driven by an actual TV signal. The power consumption of the screen in the white field mode was 20 W and the maximum power consumption of the entire circuit was 50 W; this figure can be reduced by a factor of 4 to 5 times by using more efficient LED structures and CMOS IC's, as well as LSI technology for the screen control circuitry. Figures 3; references 4: 2 Russian, 2 Western.

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CSO: 1860/270

UDC 77.027.31:621.357.12

TRENDS IN THE DEVELOPMENT OF MODERN INDUSTRIAL EQUIPMENT FOR ELECTROLYTIC EXTRACTION OF SILVER FROM FIXING SOLUTIONS

Moscow TEKNIKA KINO I TELEVIDENIYA in Russian No 9, Sep 86 pp 9-14

[Article by G.V. Velichko, T.B. Korotayeva, All-Union Scientific-Research Cinematography and Photography Institute; and A.I. Telnov, Mobile Television Unit, State Committee of the Council of Ministers of the USSR for Cinematography]

[Abstract] An analysis is made of modern foreign and domestic equipment for electrolytic extraction of silver from fixing solutions. The basic tendencies in perfecting equipment for electrolysis of silver are formulated. The principal trends in the improvement of domestic electrolysis baths of a new generation are considered. Tables show: 1) The world production of electrolysis baths for regeneration of silver from a fixing solution; and 2) The principal characteristics of foreign highly-productive electrolysis baths. References 19: 12 Russian, 7 Western.

6415/9835
CSO: 1860/35

UDC 621.397.61:621.397.132]-181.4 + 681.772.7-181.4

STANDARDIZATION OF PARAMETERS OF SINGLE-TUBE SMALL COLOR TELEVISION CAMERA

Moscow TEKNIKA KINO I TELEVIDENIYA in Russian No 9, Sep 86 pp 20-24

[Article by A.G. Vaniyev]

[Abstract] The possibility of standardization of the parameters of a single-tube small television camera is considered. Two tables list the technical parameters and component base of such cameras. The problem of a choice of a system is examined and it is shown that from the point of view of the requirements imposed by consumers, the most promising are "phase" and "index." References 10: 5 Russian, 5 non-Russian.

6415/9835
CSO: 1860/35

SMALL-SIZE NONCONTACT CURRENT COLLECTOR OF MULTICHANNEL VIDEO TAPE RECORDER

Moscow TEKHNICA KINO I TELEVIDENIYA in Russian No 9, Sep 86 pp 25-28

[Article by O.V. Fratkin, Leningrad Optical-Mechanical Union
imeni V.I. Lenin]

[Abstract] The construction is described of the magnetic circuits of multichannel noncontact induction current collectors which make it possible to decrease the dimensions and mass, with retention of the qualitative characteristics. As a result of the work considered, the characteristics of six- and eight-channel current collectors were optimized. Figures 7; references 11: 6 Russian, 5 Western.

6415/9835

CSO: 1860/35

TABULAR PROCESSOR AND ITS USE FOR DIGITAL IMAGE PROCESSING

Moscow TEKHNICA KINO I TELEVIDENIYA in Russian No 9, Sep 86 pp 29-33

[Article by A.G. Gudnov, G.F. Karpenko, S.A. Popov, and P.I. Smorchkov]

[Abstract] The tabular processor described includes a satisfactorily simple circuit solution, has universality, a high stability of performance, flexibility during a change of characteristics, and programmed control, which opens wide prospects for its use in combination with analog-to-digital and digital-to-analog converters and microcomputers, both for scientific investigations in the field of adaptive systems of gamma and color correction, and in equipment for improvement of the quality of an image operating in a real time scale. Functional diagrams of the tabular processor and a number of its components are explained. Figures 6; references 6: 4 Russian, 2 Western (1 in Russian translation).

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CSO: 1860/35

UDC 621.374.3(088.8)

MILLISECOND ONE-SHOT MULTIVIBRATORS USING TRANSISTOR ANALOGS OF p-n-p-n STRUCTURE

Moscow RADIOTEKHNIKA in Russian No 4, Apr 86 (manuscript received after revision 5 Aug 85) pp 39-42

[Article by M.I. Bogdanovich]

[Abstract] One-shot multivibrators can be designed around transistor analogs of a p-n-p-n structure. The monostable state stability of such devices is governed by the timing resistor and the input volt-ampere characteristic. The resulting constraints on the maximum resistance in the time constant circuit increase the size of the timing capacitor; this difficult can be circumvented by using multiple input multivibrators that use additional transistors to produce the analogs of the input p-n-p-n structure in order to achieve the volt-ampere characteristics that minimize the size of the RC components. Several such one-shot multivibrator designs are shown that can generate pulses with widths of from a few milliseconds up to a few tenths of a second with timing capacitors of 0.1 to 0.5 microfarads. Figures 7; references: 8 Russian.

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CSO: 1860/270

UDC 535.854

PHOTORECEIVERS FOR DETECTION OF OPTICAL PULSE SIGNALS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 86 (manuscript received after revision 28 Dec 85) pp 27-29

[Article by S.F. Glagolev, V.V. Rudnitskiy, and V.R. Sumkin]

[Abstract] Probing of optical fibers for inhomogeneities and breaks involves detection of weak pulse signals at a low repetition rate. Signal distortion is not critical, owing to unlikely appearance of pulses in close succession, but optimization of the photoreceiver design is essential. A receiver for this application is considered which consists of a silicon photodiode in the input stage, a voltage amplifier or a current amplifier, and a low-pass filter in the output stage. Expressions for the maximum signal and noise input voltages in the case of a voltage amplifier and for the maximum signal and noise output voltages in the case of a current amplifier indicate that, for any given duration of the optical pulse, there are optimum magnitudes of load impedance and avalanche multiplication which minimize the photoreceiver threshold power. Figures 2; references 6: 4 Russian, 2 Western (1 in Russian translation).

2415/9835

CSO: 1860/23

UDC 621.3.037.372

PROBABILITY OF 'MULTIPLICATION' OF CYCLIC-SYNCHRONISM FAILURE IN DIGITAL DATA TRANSMISSION SYSTEMS

Moscow RADIOTEKHNIKA in Russian No 7, Jul 86 (manuscript received after revision, 12 Mar 86) pp 59-62

[Article by L.N. Oganyan and B.N. Tikhonov]

[Abstract] Considering that failure of cyclic synchronism in digital data transmission systems "multiplies" when the antijamming device in the

—lower stage of signal separation is full while there is no state of synchronism in the upper stage of signal separation, two parameters are calculated which characterize the quality of receivers in terms of the probability distribution of the durations of absence of cyclic synchronism. These are the probability density of countable time segments preceding completion of search of a synphasal state in the j -th stage $p(t_j)$ and the probability distribution of filling the antijamming device in i steps $p(t_k^{j-1})$. Both are calculated for receivers invariant and not invariant with respect to digital errors, invariant ones revealing a much lower probability of failure "multiplication" because of a large number of sync-group symbols in both upper and lower stages of signal separation. Figures 5; references: 3 Russian.

2415/9835
CSO: 1860/23

UDC 621.391.2

EFFECT OF FREQUENCY DEVIATION ON INTERFERENCE IMMUNITY OF AUTOCORRELATIONAL SIGNAL RECEPTION

Moscow RADIOTEKHNICA in Russian No 7, Jul 86 (manuscript received after revision 9 Oct 85) pp 67-70

[Article by R.E. Gut, Yu.B. Okunev, and N.M. Sidorov]

[Abstract] An exact expression is derived which describes how the interference immunity of autocorrelational reception of signals with phase-difference modulation depends on the magnitude of frequency deviation from nominal. On the basis of this expression is energetically estimated the error of known approximate expressions based on an equivalent spectral density of noise $h_{eq}^2 = h_0^2 \cos^2 \Delta\omega T$, this error being at least 1 dB for frequency deviations $\Delta\omega T \leq 1/4\pi$ at noise levels $h^2 \geq 4$ and for phase-difference modulation with $FT \leq 10$. Figures 3; references: 5 Russian.

2415/9835
CSO: 1860/23

DIALOG EQUIPMENT FOR RECEPTION OF LONG-DISTANCE TELEPHONE CALLS

Moscow ELEKTROSVYAZ in Russian No 9, Sep 86 (manuscript received 27 Feb 86)
pp 7-9

[Article by I.R. Kazachuk, Yu.M. Mazniker, K.M. Mussel, and V.A. Shur]

[Abstract] The number of long-distance connections continuously increases and automatic connections form their basis. However, although the ratio of the number of manual and semiautomatic connections with respect to the overall traffic has decreased in percentage, their absolute number has a tendency to increase. Since the possibilities for the use of short supply manual labor and increasing the number of exchange work sites are limited, the increase in manual and semiautomatic traffic affects the volume of long-distance traffic as a whole. A decrease in this effect and a significant increase in the productivity of switchboard operators in a manual switch room is made possible by automation of the manual processes of the call service of long-distance telephone stations. Dialog equipment developed at the Moscow Department of the Central Scientific-Research Institute of Communication, based on the Elektronika-60 microcomputer, makes it possible to receive automatically a considerable number of long-distance telephone calls. Subscriber service is improved, productivity of switchboard operators is increased and a base is created for the subsequent automation of all call services. Figures 1; references: 3 Russian.

6415/98835
CSO: 11860/36

VOICE AUTOINFORMANTS ON A BASE OF STATIC DIGITAL STORAGE DEVICES FOR COMMUNICATION SYSTEMS: SURVEY

Moscow ELEKTROSVYAZ in Russian No 9, Sep 86 (manuscript received 15 Feb 86)
pp 17-223

[Article by V.G. Gorlov]

[Abstract] Because of technical-economic and operational advantages, the devices considered for automatic transmission of voice information (autoinformants) on a base of static digital storage devices are gradually replacing magneto-mechanical analogs in communication systems. Many applications at present of autoinformants are listed. Digital methods of processing voice signals, the use of standard principles of construction and digital technique elements make it possible to raise the level of unification, to improve the mass-size characteristics, and to assure the flexibility of

construction of the equipment. Data on domestic and foreign autoinformants are presented in tables, and many applications are listed. According to foreign data, in 1986 production of autoinformants in Europe increased, as compared with 1982, from 324 thousand units to 960 thousand units. Sixty-five suppliers will manufacture more than 100 models. Figures 8; references 13: 10 Russian, 3 Western.

6415/9835
CSO: 1860/36

UDC 621.395.722;621.395.345

ECONOMIC BUILD-UP OF SWITCHING FIELD CAPACITY OF QUASI-ELECTRONIC AUTOMATIC LONG-DISTANCE TELEPHONE EXCHANGE

Moscow ELEKTROSVYAZ in Russian No 9, Sep 86 (manuscript received 9 Jul 85)
pp 31-34

[Article by A.V. Lasskiy]

[Abstract] In telephone systems with program control, the structure of the switching field should be sufficiently simple so that uniform distribution of the load with respect to various switching elements, simplicity and uniformity of search by connecting routes, and the ease of build-up of the capacity of the switching field without loss of load are assured. Specifically, this is important for quasi-electronic systems which require effective use of a switching point. With ordinary block construction and build-up of the capacity of the switching field the problem amounts to determining a method of connection of the switching units. The present article describes the selection of a set of connections in the switching field of a KVARTS automatic long-distance telephone switching system. Figures 2; references 6: 3 Russian, 3 Western.

6415/9835
CSO: 1860/36

UDC 621.396.4

LOCAL OSCILLATORS FOR RECEIVER-TRANSMITTERS OF MICROWAVE RADIO-RELAY STATION

Moscow ELEKTROSVYAZ in Russian No 9, Sep 86 (manuscript received 6 Feb 86)
pp 35-38

[Article by A.P. Protopopov and V.A. Cherepukhin]

[Abstract] A highly-stable microwave oscillator based on a GaAs field-effect transistor with a Schottky barrier, a dielectric (cavity) resonator

stabilized on a frequency basis, and ring phase locking are described. Such construction with respect to FM noise and frequency stability makes it possible to use the positive characteristics typical of both quartz oscillators as well as a transistor self-excited oscillator with phase automatic frequency control. The oscillator is intended for operation in radio-relay stations of the 4 GHz band as local oscillators for a receiver and transmitter. The highly-stable local oscillator described satisfies contemporary requirements imposed on sources of microwave power for unattended communication systems maintained under extreme conditions. Figures 3; references 5: 2 Russian, 2 Western (1 in Russian translation).

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ANALYSIS OF MEASUREMENT LOSSES AND LOSSES OF AUTHENTICITY IN DIGITAL COMMUNICATION CHANNELS

Moscow ELEKTROSVYAZ in Russian No 4, Sep 80 (manuscript received 14 Nov 85)
pp 41-44

[Article by V.F. Aleksandrov and O.Ya. Tetivko]

[Abstract] An analysis is made of the error of measurement of the losses of authenticity in a digital channel, without interruption of communications caused by a measurer of the losses of authenticity, constructed according to the method of pseudoerror detection. The theoretical basis of this method of measurement and the principles of construction of a corresponding measuring unit are given in a 1984 article by V.F. Aleksandrov, G.L. Lvov, and O.Ya. Tetivko. The present article considers the following: 1) Simplified block diagram of measurer; 2) Approximation error of nominal characteristic of pseudoerror detection; 3) Methodical error of unit for measurement of error, and unit for measurement of pseudoerror; 4) Error of calibration; 5) Measurement error; 6) Additional error; and 7) Total error. As the result of the analysis, the errors of the measurer of the losses of authenticity, constructed according to the pseudoerror detection method, are shown to be basically determined by an error of calibration. Figures 4; references 9: 8 Russian, 1 Western.

6415/9835
CSO: 1860/36

PNEUMATIC PARAMETERS OF OPTICAL CABLES

Moscow ELEKTROSVYAZ in Russian No 9, Sep 86 (manuscript received 27 Aug 85)
pp 45-47

[Article by Yu.V. Zavadskiy, V.M. Kovrigo, V.N. Korshunov, and
S.M. Novokhatko]

[Abstract] Optical cables are protected against moisture by 1) water-repellant filling of cables and 2) maintenance of cable under excess air pressure. The deficiency of the first method is the mechanical and chemical contact of the light conductor with the filling materials; the deficiency of the second is the complexity of functioning of the system of maintaining the cable under pressure because of the comparatively small area of the cross section and the high pneumatic resistance of the optical cable. This led to the investigation of question of protection, in order to solve the problem of preventing the entrance of moisture into optical cables of both existing constructions and those under development. The results are presented of measurement and evaluation of the pneumatic parameters of cables intended for use on trunk lines of municipal telephone networks on the supposition that the excess air pressure method is advisable. Figures 5; references 9: 6 Russian, 3 Western.

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CHOICE OF STRUCTURE OF DIGITAL TRANSMITTER FOR SIGNAL CONVERSION DEVICES

Moscow ELEKTROSVYAZ in Russian No 9, Sep 86 (manuscript received 18 Apr 85)
pp 51-52

[Article by A.M. Bograd, B.S. Danikov, and L.G. Izrailson]

[Abstract] During the creation of information-computing networks, problems of designing equipmentment, in particular, signal conversion devices (SCD) based on digital technology for high-speed data transmission systems, are of great significance. In the present article the structure is proposed of a digital transmitter for SCD (with a specified accuracy for shaping the signal spectrum), which minimizes the number of elementary operations. Figures 3; references 2: 1 Russian, 1 Western.

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DEVICE FOR DIGITAL PROCESSING OF GROUP SIGNAL ON THE BASIS OF A WALSH FUNCTION

Moscow ELEKTROSVYAZ in Russian No 9, Sep 86 (manuscript received 11 May 85)
pp 52-54

[Article by V.A. Vershinin and V.S. Lando]

[Abstract] A block diagram is presented of a device for digital processing of a group signal on the basis of a Walsh function, and its operation is described. Expressions are obtained which make it possible to evaluate the decrease of interference immunity, in the case of the presence of interference in the form of white noise, as a function of the quantization step. Choice of the acceptable quantization step produces a valid choice of the maximum number of pulses in a packet at the output of the converter and the capacity of the reversible counters. Figures 3; references: 2 Russian.

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CSO: 1860/36

COMPARISON OF JAMMING IMMUNITY OF RADIO LINKS USING BROADBAND SIGNALS

Moscow RADIOTEKHNIKA in Russian No 4, Apr 86 (manuscript received after revision 15 Nov 85) pp 19-21

[Article by A.P. Bilenko and L.N. Volkov]

[Abstract] Digital data transmission systems can be effectively protected against intentional interference by two broadband transmission techniques: 1) Expanding the spectrum of each information symbol (use of pseudorandom or pseudonoise signals); 2) Spectrum expansion by rearranging the working frequencies, where one or an entire group of information symbols are transmitted at a single frequency. There are various estimates of the jamming immunity provided by these two methods. This paper resolves the disparity of such estimates by demonstrating the actual interference immunity of the methods and defines the optimal jamming pulse transmitter power for these two cases. The amount by which the pulsed transmit power, generating optimally timewise intermittent interference, exceeds the average transmitter power for continuous noise jamming is also estimated for fixed signal power levels and error probabilities. Jamming immunity for the above two broadband transmission methods is ultimately found to be the same relative to the optimal interference for each method; without noise-immune coding, the immunity is quite low, while with such coding, which takes into account the specific features of the jamming, the immunity can be brought close

to the gaussian white noise case. Figures 2; references 6: 4 Russian, 2 Western.

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ADJACENT CHANNEL INTERFERENCE IN MOBILE CELLULAR COMMUNICATIONS SYSTEM

Moscow RADIOTEKHNIKA in Russian No 4, Apr 86 (manuscript received after revision 16 Sep 85) pp 24-27

[Article by L.Ye. Varakin and A.Yu. Goncharenko]

[Abstract] The noise immunity of a cellular mobile communications network is a function of the level of crosstalk, in turn governed by the guard spacing between base stations using the same frequency. Adjacent channel interference is also a factor in such systems and is characteristic of frequency division multiplexing. Adjacent channel interference at the inputs to base station and subscriber receivers in any cell is generated by all cells occupying a frequency adjacent to the receive frequency. This paper determines the signal to interference ratio at the inputs to these receivers for the case of hexagonal cells, taking the effect of near and far field interfering stations into account. Analytical expressions are derived for adjacent channel interference suppression in the IF filter of the receiving station. This suppression technique is shown to be inadequate when the interference is generated by a large number of stations and the frequency separation between the channels must be increased or the signal spectrum of the transmitters must be more stringently limited in this case. Figures 3; references 4: 2 Russian, 2 Western (in Russian translation).

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VARIABLE DELAY DEVICE FOR DIGITAL COMMUNICATIONS SYSTEM

Moscow RADIOTEKHNIKA in Russian No 4, Apr 86 (manuscript received after revision 8 Sep 85) pp 32-34

[Article by A.N. Zinovyev and V.V. Shestakov]

[Abstract] Multiple access digital communications systems using time division multiplexing with packet switching require synchronization with a relative error of less than $3 \cdot 10^{-4}\%$ (relative to the frame length) for efficiencies of 0.9 to 0.95. The primary difficulty in the design of such precise synchronization systems relates to the system for tracking the propagation delay during deep fades over the path. This requires a model that simulates the transmission channel and models all of the destabilizing factors. The simulation system in an experimental terminal automated measurement system for F-TDMA communications contains a controlled variable delay circuit for the binary data packets, which is connected to one of the input-output ports of the control microcomputer of the instrumentation system. This paper describes the variable delay system that has a working algorithm determined by the microcomputer program and the operational load of the interface controller. Practical experience with the delay circuitry has shown that for binary information packets of less than 16 bits, K155IYe7 asynchronous binary counters can be used, and with more than 16 bits, SN74193 synchronous binary counters can be used. The device enables simple implementation of time switching of the information packets in any channel interval of a frame. Figures 1; references 5: 2 Russian, 3 Western (2 in Russian translation).

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ANALYSIS OF LOCK-ON AND LOSS-OF-TRACKING PROCESSES IN DELAY-BASED SYNCHRONIZATION SYSTEM WITH EXPOSURE TO STRUCTURED INTERFERENCE

Moscow RADIOTEKHNIKA in Russian No 4, Apr 86 (manuscript received 18 Jul 85) pp 34-37

[Article by I.A. Zaulin and V.P. Ponomarenko]

[Abstract] Correlation receiving system for phase-keyed signals subjected to structured interference similar to the signal, but differing from it in the amplitude and time shift can experience a loss of tracking or be incapable of establishing a signal delay tracking mode. The nonlinearity of delay-based synchronization systems creates difficulties in the determination of the steady state synchronous modes of such systems as well as in establishing

the regions of their existence and analyzing the conditions for the occurrence of these modes as a function of the parameters and initial conditions. Since computerized numerical methods are the most effective in this case, this paper is a summary of the development and application of a specialized set of programs for the dynamic behavior of delay synchronization systems exposed to fluttering structured interference with a monotonically changing delay. Three characteristic regions are defined that govern system stability: 1) The region of tracking retention when the locked-on system is subjected to the interference; 2) The lock-on range in the signal acquisition mode; 3) The lock-on probability when the tracking the signal and the interference. While the programs themselves are shown, the results of the application of the algorithms to the computation of these regions are illustrated graphically for various system and interference parameters. No specific designs or hardware are discussed. Figures 2; references 6; 5 Russian, 1 Western (in Russian translation).

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INFLUENCE OF LOWER TRANSMITTANCE BAND CUTOFF OF PHOTODETECTOR ON NOISE IMMUNITY OF LIGHTGUIDE COMMUNICATIONS SYSTEMS

Moscow RADIOTEKHNIKA in Russian No 4, Apr 86 pp 88-89

[Article by A. Blushke and V.I. Yemin]

[Abstract] Capacitive coupling is used in the photodetectors of lightguide transmission systems and limits the lower cutoff frequency of the passband. This introduces signal waveform distortion in addition to the usual thermal and shot noise plus intersymbol interference. While this cutoff problem is usually analyzed using a probabilistic description of the photodetector in a gaussian approximation, assuming the additivity of all the interference, this paper employs an asymptotic representation of the distribution (nongaussian) at the photodetector output in order to derive expressions for the overall error probability for a two-pulse waveform and four-position pulse keyed signal with a single guard band. The error probability is found analytically as a function of the lower cutoff frequency, so that one can determine the permissible low frequency that will not affect the received power level negatively while simplifying the photodetector design. At a data rate of 8.448 Mbit/s, the low frequency cutoff must be less than or equal to 100 kHz. This published paper is an abbreviated version of the manuscript of 12 pages, 3 figures and 8 references, deposited as document No. 671 at the Informsvyaz Center for Scientific and Technical Information. Figures 2; references: 1 Russian.

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PARAMETERS OF ISTOK EXCHANGE SOFTWARE

Moscow ELEKTROSVYAZ in Russian No 8, Aug 86 (manuscript received 2 Oct 85)
pp 6-9

[Article by Ye.L. Misulovina, Scientific Research Institute of Communications and Ogrskiy Communication Center of Latvian SSR]

[Abstract] The cost of a control unit for a quasi-electronic automatic telephone exchange, operating according to a recorded program, depends on its performance and volume of the addressed memory. For this reason, during creation of functional software for the control unit, it is necessary to approach optimization of these parameters, and consequently it is necessary to know their characteristics. Up to the present these characteristics were investigated by analytical means, which did not take into account certain nuances of real functional software. The present article presents the results obtained from part of experimental investigations of the functional software which makes it possible to choose means for their optimization. The investigations were conducted in a section of a rural telephone network constructed on the basis of exchanges of the integrated analog-digital communication system (IATSKE) Istok. These investigations are explained using block diagrams and tables. Figures 3; references: 1 Russian.

6415/9835
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SOFTWARE OF THE ISTOK EXCHANGE MICROPROCESSOR RESERVE CONTROL DEVICE

Moscow ELEKTROSVYAZ in Russian No 8, Aug 86 (manuscript received 7 Jun 85)
pp 2-6

[Article by A.G. Popova, V.M. Kukovkina, and A.S. Serebryakov]

[Abstract] Industry in the USSR and the German Democratic Republic has mastered production of the equipment for the exchanges of the Istok Unified Analog-Digital Communication System. With a view to expansion of the possibilities of the system, development is conducted at the Electrical Engineering Institute of Communication on devices for its microprocessor control, in particular functional software and equipment for a section intended for interfacing of blocks of existing systems with newly developed microprocessor units. Istok (otherwise IATSKIE--integrated automatic telephone exchange [ATS] of the quasi-electronic type) includes in itself the equipment of quasi-electronic ATS, Types 1 (IATSKEL) and 3 (IATSKE3). On the basis of the equipment for this system it is possible to organize an integrated-control communication network, including one IATSKEL exchange

and from 1 to 32 IATSKE3 exchanges. In so doing, the IATSKE1 is foremost and the IATSKE3 slave driven with respect to control as viewed from IATSKE1. For economic reasons it is advisable to use the IATSKE1 exchanges with off-line control as a terminal exchange. To ensure control of setting-up a call between Type 1 and 3 exchanges, a common control channel (CCC) is organized. Impairment of the CCC is equivalent to complete failure of the IATSKE3 equipment. Inasmuch as such a situation is liable to appear because of damage to a cable, the idle time of all the IATSKE3 exchanges, determined by the time for its restoration, may exceed the permissible norm of the overall idle time of the exchange. In order to prevent disturbance of communication in case of impairment of the CCC for IATSKE3 exchanges, the Moscow Electrical Engineering Institute of Communication developed a reserve control device (RCD). During development of the RCD, the domestic microprocessor MDKR580IK80 was selected as its elementary base. The present article describes in detail the software of this Istok exchange microprocessor RCD, using a number of figures. Figures 6; references: 7 Russian.

6415/9835
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DEVICE FOR GUARANTEED SUPPLY OF ISTOK UNIFIED ANALOG-DIGITAL COMMUNICATION SYSTEM

Moscow ELEKTROSVYAZ in Russian No 8, Aug 86 (manuscript received 6 Jul 84)
pp 59-61

[Article by M.V. Brodskiy and V.Ye. Rubinraut]

[Abstract] The introduction into rural communication networks of the unified analog-digital system Istok (otherwise IATSKE-integrated automatic telephone exchange) and the use of a transmission system with pulse-code modulation (PCM) lead to toughening up of the requirements on the quality of the output voltage of the electrical supply device. A device for guaranteed supply (DGS) of Istok developed at the Central Design Office of the Ministry of Communications, USSR, is described in detail. It is intended for the electrical supply of IATSKE of type 3 with a capacity of 64 to 256 numbers and PCM transmission, as well as for charge and maintenance of storage batteries when available. The DGS is designed for operation from a network of single-phase alternating current of a rated voltage of 220V or from two phases of a network of three-phase alternating current with a voltage of 380 V and a 50 Hz frequency. In the latter case a "zero" conductor of the network is connected to the DGS. The DGS operates in a buffer regime with storage batteries consisting of 30 lead-acide accumulators or without it, and includes two identical rectifier devices (operating and reserve) and devices for protection, monitoring, and signaling (local and distant). The principal characteristics of the DGS are presented in a table. Series output of the DGS began in 1986.

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SYSTEM OF MONITORING AND DIAGNOSIS OF PERIPHERAL PROCESSOR OF NEVA-1M
CONTROL COMPLEXES

Moscow ELEKTROSVYAZ in Russian No 8, Aug 86 (manuscript received 25 Nov 85)
pp 9-12

[Article by M.Kh. Goncharok and Ye.S. Zapasskaya]

[Abstract] In the Kvarts quasi-electronic automatic long-distance telephone exchanges, connection of the electronic controlling machine to the telephone equipment, the so-called passive telephone peripheries, is accomplished by special matching devices which have acquired the name peripheral processors (PP). The PP, together with a central processor, a device for connection with the operational memory, and a group of channels enter into the structure of two special purpose control computers forming the Neva-1M control complex. The system described in the present article for monitoring and diagnosis of the PP of the Neva-1M is based on the principle of a combination of equipment and program monitoring. Use of functional and diagnostic tests shows that the mutual effect and the addition to each other of both forms of monitoring make it possible to accomplish a search for trouble with sufficient accuracy. Figures 1; references: 6 Russian.

6415/9835
CSO: 1860/16

METHOD OF RECOGNITION OF BINARY CODE SEQUENCES

Moscow ELEKTROSVYAZ in Russian No 8, Aug 86 (manuscript received 11 Dec 84)
pp 12-15

[Article by B.M. Rakhimbekov]

[Abstract] One of the most common functions realizable by communication equipment is recognition of incoming information, the nature of which gives rise to a unique reaction of the system. The recognition process itself is based on a comparison of incoming information with that known beforehand (reference). In practice the method using a complete exhaustive search of reference variations is most often used for recognition of incoming information. This is the simplest from the point of view of its fulfillment. A method of recognition is described which, even with the necessity of recognizing short sequences, gives an advantage in the volume of memory necessary for the storage of reference information. Use of this method makes it possible to accomplish dynamic tracking of incoming information, maximum reduction of the reaction time of the system, makes it possible at the time of comparison not to process the entire sequence of characters

received but only one character, as well as to increase the reliability of the information received. This makes it possible to increase the efficiency of various forms of communication equipment under development. Figures 5; references: 1 Russian.

6415/9835
CSO: 1860/16

UDC 621.394(395)

DETERMINATION OF CONDITIONS FOR OPTIMUM DESIGN OF COMMUNICATION NETWORKS WITH BY-PASSES, IN THE CASE OF NONCOINCIDENTAL PEAK-LOAD HOURS

Moscow ELEKTROSVYAZ in Russian No 8, Aug 86 (manuscript received 6 Jul 84)
pp 21-23

[Article by V.M. Dubrovinskiy]

[Abstract] In networks with by-passes, the by-pass bunches are common resources which are used for servicing the redundant load from any high-utilization bunches (HUB). The presence of such common resources creates a prerequisite for an account of shifts of the peak-load hour in various HUB. A condition is considered for uniform use of the network resources in various time periods. It is shown that the process of equalizing the load cannot be decisive in deriving the minimum expenditure for the network. However, consideration of the criterion of uniform use of the resources of the network at various hours lightens the search for a minimum expenditure for the network. References 3: 2 Russian, 1 Western.

6415/9835
CSO: 1860/16

UDC 621.396.43(075.8):621.391.82

LIMITS OF DENSITY INCREASE OF NETWORK OF DIGITAL RADIO RELAY LINES

Moscow ELEKTROSVYAZ in Russian No 8, Aug 86 (manuscript received 11 Mar 86)
pp 25-29

[Article by N.I. Kalashnikov, A.A. Kalinin, and A.I. Kalinin]

[Abstract] A 1983 article by the above authors investigated the possibility of increasing the density of an analog radio relay line network, operating in the 2-8 gigahertz band, in the case of the transmission of multi-channel telephone communications with (frequency division of channels - FM), in the case of the reduction of spans. The present article solves a similar problem in connection with a digital radio relay line. The analysis conducted

did not take into account the reduction of stability of communications on a digital radio relay line caused by the effect of frequency selectivity of the interference fading. However, reduction of the spans leads to a significant decrease of this effect. Figures 5; references 8: 5 Russian, 3 Western.

6415/9835
CSO: 1860/16

UDC 621.396.43

OPTIMIZATION OF THE BAND WIDTH OF RECEIVING CHANNEL OF EIGHT BROADBAND CHANNEL RADIO RELAY SYSTEMS

Moscow ELEKTROSVYAZ in Russian No 8, Aug 86 (manuscript received 15 Feb 86)
pp 29-33

[Article by D.V. Mermelshteyn]

[Abstract] A method is considered for determining the optimum band width of the receiving channel of an eight broadband trunk line communication system with line of sight, during transmission of the signals of systems which use frequency separation of channels with a capacity of 1920 voice frequencies. The process for calculating the over-all power of the internal noise of the radio relay system described in the article makes it possible to determine the band width of the receiving channel, and protection with respect to polarization of the microwave signals of neighboring radio relay line broadband channels which must be achieved in designing eight broadband channel radio relay lines with large capacity. Realization of these requirements makes it possible to increase by two times the traffic capacity of radio relay trunk lines with a maximum traffic capacity of each radio trunk of not less than 1920 voice frequency channels. Figures 5; references: 5 Russian.

6415/9835
CSO: 1860/16

USE OF ATTENUATORS IN MICROWAVE TRANSMITTING CHANNELS OF RADIO RELAY SYSTEM

Moscow ELEKTROSVYAZ in Russian No 8, Aug 86 (manuscript received 15 Apr 86)
pp 33-35

[Article by O.P. Frolov]

[Abstract] Equal distances between adjacent exchanges are not found in real radio relay lines. This nonuniformity leads to deterioration of the quality indices of the line's operation, caused in the first place by an increase of the power of noncircuit noises. In principle it is possible to reduce this effect by the introduction of attenuators into the microwave transmitting channels of the exchanges. At the same time, however, the level of the effective signal received is decreased, which in turn leads to an increase of the level of the thermal noise power. In the present article a method is considered for determining the optimum values of the damping factors of attenuators which make it possible to minimize the sum of the average noise power in the voice frequency channels of radio relay lines. This introduction of attenuators into microwave transmitting channels is most advisable in the case of radio relay lines where the level of noncircuit noise is commensurate with the level of the thermal noise or exceeds it. It is not possible to introduce additional attenuation into the microwave transmitting channels of all lines, but only into that part where there is a large irregularity of the distances between adjacent exchanges. Figures 1; references: 3 Russian.

6415/9835

CSO: 1860/16

EFFECT OF COMPRESSOR ON THE AVERAGE POWER OF A SIGNAL IN BROADCASTING CHANNEL

Moscow ELEKTROSVYAZ in Russian No 8, Aug 86 (manuscript received 7 Dec 84)
pp 36-39

[Article by A.A. Glukhov]

[Abstract] During development and planning of the equipment used by long-distance channels for audio broadcasting, as well as in choosing the optimum type of operation for group long-distance communication channels, it is necessary to know the effect of the compressor of the AV-2/3 channel-generating equipment on the average power of the broadcast signal. Information concerning the distribution of the average power of the broadcast signal is also necessary for specialists concerned with the development of equipment for digital audio broadcasting transmitting broadcasting signals in digital form. In the present article a statistical investigation of the distribution

of the parameters of the average power of the broadcast signals is described in detail. Figures 4; references: 9 Russian.

6415/9835
CSO: 1860/16

UDC 621.3.052

EVALUATION OF EFFICIENCY OF ASYNCHRONOUS TRANSMISSION OF FACSIMILE SIGNAL
OVER A SYNCHRONOUS DIGITAL CHANNEL

Moscow ELEKTROSVYAZ in Russian No 8, Aug 86 (manuscript received 3 Dec 84)
pp 44-47

[Article by A.S. Adzhemov]

[Abstract] A procedure for evaluation of the efficiency of facsimile signal transmission is proposed which makes it possible to calculate the potential limits of efficiency, and provides a superior evaluation of various methods under development for increasing such efficiency. A method of linewise transmission of a facsimile signal is described. The procedures for facsimile transmission described can be generalized and used for other methods of image transmission. Figures 4; references: 2 Russian.

6415/9835
CSO: 1860/16

UDC 621.397.121.07

PRELIMINARY PROCESSING OF VIDEO SIGNAL DURING TRANSMISSION OF FACSIMILE
INFORMATION

Moscow ELEKTROSVYAZ in Russian No 8, Aug 86 (manuscript received 29 May 85)
pp 48-50

[Article by V.I. Golosnoy, G.F. Balkin, A.G. Zaychenko, V.S. Lyashevich,
N.I. Kat, and M.N. Sapunkov]

[Abstract] A method is proposed for preliminary processing of a video signal, which makes it possible on the one hand to increase transmission efficiency by approximately 1.6-2 times, and on the other to provide an acceptable quality of reproduction of typescript and manuscript with low density of scanning. This method assures an increase of the efficiency of the one-dimensional standard code of the International Consulting Committee for Telephone and Telegraph (CCITT) by more than 70% for typescript text and 50% for manuscript. Figures 1; references 10: 8 Russian, 2 Western.

6415/9835
CSO: 1860/16

USE OF THE PRINCIPLE OF FORECASTING EXPECTED SIGNAL AMPLITUDE FOR CONTROL OF THE PARAMETERS OF LOW-FREQUENCY AMPLIFIERS

Moscow ELEKTROSVYAZ in Russian No 8, Aug 86 (manuscript received 10 Nov 85)
pp 40-43

[Article by B.K. Baranovskiy]

[Abstract] The possibilities of practical realization of the principle of control with forecasting were investigated during a study of questions concerned with improvement of the energy indices of Type ADI636A amplifiers with an output power of 500 W, produced by TESLA (Czechoslovakia). The following sections of the article are considered in detail: 1) Improvement of efficiency of low-frequency amplifier as the result of automatic switching of the power supply of the amplifier; and 2) Increase of average power of broadcast signals by automatic regulation of the amplification factor. The article concludes that it is possible to realize the principle of control of the parameters of low-frequency amplifiers with forecasting by simple technical means. In so doing a considerable reduction takes place of the non-linear distortions which occur in the control process, as compared with methods of regulation in a real time scale. Figures 4; references 6: 5 Russian, 1 Western (in Russian translation).

6415/9835
CSO: 1860/16

MODULE FOR EFFECTIVE JOINING OF ILPN-204 INDUSTRIAL SEMICONDUCTOR LASER WITH MONOMODE FIBER GUIDE

Moscow ELEKTROSVYAZ in Russian No 8, Aug 86 (manuscript received 25 Jun 85)
pp 51-53

[Article by M.I. Belovolov, Ye.M. Dianov, and A.P. Kryukov]

[Abstract] The results are presented of an investigation of the entry of the radiation of strip-geometry diode lasers into a monomode fiber guide where high-quality lens microobjectives are used as a matching element, and a description is given of the simple construction of a module for effective joining of the ILPN-204 industrial semiconductor laser with a monomode fiber guide, with an entry of optical power not less than 0.5 mW. Figures 4; references 3: 1 Russian, 2 Western.

6415/9835
CSO: 1860/16

CALCULATION OF CAPACITANCE OF ONE-PAIR CABLES WITH ELLIPTICAL SHAPE OF INSULATION CROSS-SECTION

Moscow ELEKTROSVYAZ in Russian No 8, Aug 86 (manuscript received 4 Apr 85)
pp 53-55

[Article by R.A. Alikhanyan, Zh.M. Mirzabekyan, Yu.A. Parfenov, and
G.A. Sarkisyan]

[Abstract] The capacitance of one-pair cables and conductors with an elliptical shape of the insulation cross-section depends on construction of the insulation. Ordinarily the capacitance of circular shape insulated conductors is determined by the mirror transformation method, with use of the theory of potentials. However, because the strictness of this method is inadequate, the results of calculating the capacitance of cables and conductors with an elliptical shape of the insulation cross-section are inexact. The present article considers the use of precise analytical methods for determining the parameters of these cables which make it possible to avoid overexpenditure of nonferrous metals and plastic during manufacture of cables which are widely used on feeder lines during installation of wired radio equipment. Agreement of the results of computation and experiments makes it possible to recommend the proposed method. Figures 2; references: 5 Russian.

6415/9835

CSO: 1860/16

ELECTRICAL INSULATION

UDC [621.315.22 + 621.313.13 + 621.65] .048.1.019.34

RELIABILITY OF THE INSULATION OF SUBMERGED ELECTRICAL SYSTEMS AND METHODS FOR ITS PREDICTION

Moscow ELEKTRICHESTVO in Russian No. 7, Jul 86 (manuscript received 7 Jan 86)
pp 22-26

[Article by Ya.Z. Mesenzhnik, A.G. Korchagin, L.Ya. Prut, and I.S. Tyan]

[Abstract] The parameters are presented of insulation reliability during exploitation in the West Siberian petroleum/gas region of the following submerged electrical systems: 1) Cables for geophysical exploration of wells; and 2) Technical complex for oil production, consisting of oil pumps, electric motors, and power lines. Items concerned with failures of the submerged electrical systems are analyzed. The physical processes during unexpected and gradual failure of the insulation of the submerged electrical system and questions concerned with prediction of the failures are considered. Tables are presented which list: 1) Reliability parameters of elements of petroleum production systems; and 2) Measurement and predicted values of the insulation resistance of KG1-53-180 cable in the case of descent into a drill hole. Figures 2; references 16: 15 Russian, 1 Western (in Russian translation).

6415/9835

CSO: 1860/26

ELECTRON DEVICES

UDC 621.382.2/3.022.001.1

DEVELOPMENT PROSPECTS FOR HEAVY-CURRENT SEMICONDUCTOR ELECTRONICS

Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 86 (manuscript received 16 Jul 85) pp 2-5

[Article by I.V. Grekov, doctor of physicomathematical sciences, Physico-Technical Institute imeni A.F. Ioffe]

[Abstract] The contemporary state and close-up prospects for the development of the basic classes of discrete devices for heavy-current semiconductor electronics are considered. Problems connected with the development of heavy-current integrated circuits and modules are not mentioned. The critical characteristics are presented of devices based on silicon, gallium arsenide, and silicon carbide, attained up to the present time. References 13: 9 Russian, 4 Western.

6415/9835
CSO: 1860/27

UDC 621.383.4.01

KINETICS OF CHARGE ACCUMULATION IN MOS STRUCTURE DIELECTRIC

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 31, No 7, Jul 86 (manuscript received 9 Oct 84) pp 1390-1397

[Article by Yu.M. Gerasimov and A.N. Karmazinskiy]

[Abstract] An analysis is presented of the kinetics of charge accumulation in two areas of an MOS dielectric considering the diffusion photocurrent of electrons and holes and the nonlinear variation of drift photocurrent as a function of field strength. The accumulation of the charge in the dielectric is shown to depend on voltage across the dielectric and the time of irradiation and initial charge. Equations are derived which can be used to calculate the charge in the two areas for various voltages across the dielectric and with changes in the voltage during irradiation. Figures 4; references 4: 1 Russian, 3 Western.

6508/9835
CSO: 1860/9

CALCULATION OF ELECTRON-OPTICAL CHARACTERISTICS OF A MULTIDYNE CHANNEL

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 31, No 7, Jul 86
(manuscript received 26 Jan 84) pp 1422-1429

[Article by Yu.A. Flegontov and I.R. Petrbea]

[Abstract] Calculation of the statistical characteristics of the flux amplified by a channel multiplier is undertaken. The distribution of electrons at the output of the channel is determined by the initial condition of their motion in the electrostatic lens field formed by the conducting layer covering the walls of the channel and the field of the condensor formed by the system of the channels and the screen. Analytic expressions are derived for the distribution function of electrons by angles and energies at channel exit and the current density at the screen and frequency-contrast characteristics are determined for various amplification conditions. The focusing field at the output of the multidyne channel is calculated. The process of amplification of the electron flux and its transfer to the screen where the system creates an electronic image are described quantitatively using analytic expressions obtained for all flux characteristics in all stages of conversion. The expressions derived lead to more accurate results than numerical methods based on statistical testing. Two maxima are theoretically obtained in the differential energy distribution function of electrons at the channel output. The analytic model of the focusing field at the output of the multidyne can be used to study the influence of a large number of geometric and electric parameters in the multidyne-screen system on electron scattering in the plane of the screen to select parameters providing the necessary scattering spot diameter. Figures 4; references 7: 5 Russian, 2 Western.

6508/9835
CSO: 1860/9

ANALYSIS OF TRANSIENT PROCESSES IN HIGH POWER, HIGH VOLTAGE TRANSISTORS WITH ARBITRARY BASE AND COLLECTOR CURRENT PULSE PARAMETERS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 31, No 7, Jul 86
(manuscript received 3 Jul 84) pp 1430-1440

[Article by B.I. Grigorev]

[Abstract] A generalized model is suggested describing transient processes in high voltage $n^+-n-p-n^+$ structures in the stage of establishment of a steady state and scattering in the case of a pulsed current of arbitrary shape.

The possibility of transition of a transistor from partial collector modulation to excess modulation and back during switching is considered in the model, allowing determination of the major saturation characteristics of the device. A batch of type KT704A high-voltage transistors was studied. Lengths of transient process stages, transient voltage characteristics and power losses in the structures were measured, with measurements performed at low frequency to avoid the influence of heating of the devices. Experimental data agreed satisfactorily with calculated results. Figures 5; references 17: 15 Russian, 2 Western.

6508/9835
CSO: 1860/9

UDC 621.382.233.011.222.072.1

ESTIMATE OF INJECTING AREA OF CATHODIC n^+-p JUNCTION IN THYRISTORS WITH HIGH CURRENT DENSITY

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 31, No 7, Jul 86
(manuscript received 29 Jun 84) pp 1463-1466

[Article by V.A. Kuzmin and A.G. Tandoyev]

[Abstract] An estimate is presented of the dimensions of the noninjecting area of a cathode emitter as a function of current density for rectangular and cylindrical shunt geometry. Minimum values of noninjecting area are calculated. The results of estimation of the width of the noninjecting area for the shunt geometries selected are presented. Experimental results are found to agree satisfactorily with the estimates. The approximate equations derived can be used to determine the necessary boundary of the width of the noninjecting portion of a cathode emitter, determined by the influence of shunting for rectangular and cylindrical shunt geometries. Figures 2; references 6: 5 Russian, 1 Western.

6508/9835
CSO: 1860/9

MAXIMUM DENSITY OF AUTOEMISSION CURRENT IN SUBMICRON-SIZE POINT EMITTERS GROWN BY VARIOUS METHODS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 31, No 7, Jul 86
(manuscript received 24 May 85) pp 1466-1467

[Article by A.A. Nosov, D.I. Nosova, N.P. Ovssyannikov and N.N. Chadayev]

[Abstract] An experimental study is presented of the maximum current densities of point emitters grown by various methods in the form of thread-like crystals of tungsten, gold and chromium oxide with point diameters of some hundreds of angstrom units. The emitters were grown from tungsten by decomposition of an organometallic compound in its vapors; from gold by condensation of metal vapors onto a heated substrate, from Cr_mO_n by successive oxidation and reduction of the metal. The emission characteristics of the multiple-point emitters were measured in experimental diode structures evacuated to 10^{-8} mmHg. The volt-ampere characteristics were measured. It was found that for point emitters of these dimensions and materials the maximum current densities reach 10^{10}A/cm^2 as a result of the dimensional effect. Figures 2; references: 8 Russian.

6508/9835
CSO: 1860/9

INSTRUMENTATION AND MEASUREMENTS

UDC 389.14:681.3:025.4.036:681.2

KALMAN FILTER IN PROBLEMS OF MEASURING THE PARAMETERS OF NONLINEAR DYNAMIC SYSTEMS

Moscow IZMERITELNAYA TEKHNIKA in Russian No 7, Jul 86 pp 8-10

[Article by V.I. Krivotsyuk]

[Abstract] A new algorithm is proposed for a nonlinear discrete Kalman type filter for the computational facilities of information-measuring systems. Previously, Kalman filter theory could be applied only when the state vector of the complex device constituting the parameter measurement system was subject to certain linearity conditions and approximations led to errors. Figures 2; references 5: 4 Russian, 1 Western.

6415/9835

CSO: 1860/28

UDC 681.2.087.92:001.8

ANALYSIS OF STOCHASTIC INTEGRATING ANALOG-TO-DIGITAL CONVERTER WITH NORMAL DISTRIBUTION OF INPUT SIGNAL

Moscow IZMERITELNAYA TEKHNIKA in Russian No 7, Jul 86 pp 14-16

[Article by S.V. Abrosimov and Ye.A. Belov]

[Abstract] All the necessary formulas are derived which make it possible to determine the precision characteristics of a stochastic integrating analog-to-digital converter in the case where the input signal under review has normal distribution. Figures 1; references: 3 Russian.

6415/9835

CSO: 1860/28

UDC 621.372.512.029.33:621.317.741

MEASUREMENT OF THE DAMPING COEFFICIENT OF EXPONENTIAL VIDEO PULSES BY
REACTION OF A RESISTOR-CAPACITANCE FOUR-TERMINAL NETWORK

Moscow IZMERITELNAYA TEKHNIKA in Russian No 7, Jul 86 pp 40-42

[Article by A.I. Ankudinov, V.A. Kravets, and M.Ya. Semchenko]

[Abstract] A mathematical method and a device are proposed for measuring the damping coefficient of a sequence of identical damped exponential video pulses, the basis of which is the single-valued dependence of the ratio of the known damping coefficient of a resistor-capacitance four-terminal network and the unknown damping coefficient of the video pulses on the ratio of the amplitude of the pulses and the extremal value of the reaction of the four-terminal network. Figures 2; references: 4 Russian.

6415/9835

CSO: 1860/28

UDC 621.372.852

LINEAR CONTINUOUS PHASER OF QUASI-OPTICAL TYPE

Moscow IZMERITELNAYA TEKHNIKA in Russian No 7, Jul 86 pp 42-43

[Article by V.A. Golba]

[Abstract] The phaser described was used in homodyne units for measurement of the complex gain reflection in the short millimeter range of wavelengths, without use of ferrite isolators. A method is considered for construction of a frequency shift unit--a linear continuous phaser in quasi-optical transmission lines. Recommendations are made with respect to calculation of the elements of a linear continuous phaser, and the results are presented of an experimental investigation. Five papers concerned with the subject of this article are listed, of which Golba was the author or coauthor. Figures 1; references 9: 8 Russian, 1 Western.

6415/9835

CSO: 1860/28

COMPARISON OF NATIONAL MICROWAVE NOISE STANDARDS OF THE USSR AND FRANCE

Moscow IZMERITELNAYA TEKHNIKA in Russian No 7, Jul 86 p 66

[Article by G.G. Petrosyan (USSR) and L. Erar (France)]

[Abstract] A comparison conducted in the period from 1980 to 1985 of the national standards of the USSR and France for the spectral density of the noise power of radio emission is described. The results obtained confirm the accuracy of an estimate of the degree of error of both national standards. References 5: 4 Russian, 1 Western.

6415/9835

CSO: 1860/28

METHOD AND DEVICES FOR INFRARED PROBING OF BURNS

Moscow IZMERITELNAYA TEKHNIKA in Russian No 7, Jul 86 pp 52-53

[Article by V.A. Yenuchenko, Yu.I. Dmitriyev and A.N. Nevikov]

[Abstract] At the Leningrad Institute of Aviation Instrument Engineering the possibility is investigated of using the method of infrared probing for diagnosis of the degree of burn injuries, and the development of a series of diagnostic devices of the Ozhog type which differ from one another in structural execution. A statistical processing of the results of clinical tests of models of the devices was conducted in order to evaluate the methodical errors and metrological rating of Ozhog devices as indicators of the degree of thermal injury. The results obtained can be used for metrological rating of medical diagnostic devices operating on the principle of reflecting spectrophotometry. Figures 2; references 3: 2 Russian, 1 Western.

6415/9835

CSO: 1860/28

MAGNETICS

UDC 621.318.13.012:621.311.61

MAGNETIZATION SOURCES FOR STUDY OF DYNAMIC MAGNETIC PARAMETERS OF MAGNETICALLY SOFT MATERIALS

Moscow ELEKTROTEKHNIKA in Russian No 7, Jul 86 (manuscript received 2 Oct 85)
pp 52-53

[Article by Yu.N. Maslov, candidate of technical sciences, V.Ya. Pisarenko,
K.M. Tulepov and E.P. Maslova, engineers]

[Abstract] Existing magnetization systems presently being produced by industry do not include degaussers and magnetizing-demagnetizing systems have been developed to extend the applications of such equipment. However, the proposed circuitry for generating sine-wave magnetization currents is not being series produced. This paper provides a brief description and specifications for the U5057 magnetic measurement system designed for determining B_{\max} and H_{\max} as well as other magnetic parameters of samples at frequencies of 50 and 400 Hz. While this system provides a sine-wave magnetization flux curve, its frequency range is inadequate and the authors have assisted in setting up the production of a general purpose magnetizing apparatus that magnetizes and degausses at frequencies from 50 to 100,000 Hz with a special accessory for testing ring cores. The final stage is a transistorized push-pull amplifier with current equalizing resistors in the emitter circuits. Isolating capacitors are used in the output lines in order to prevent DC magnetization of the samples. This system generates both a sine-wave magnetizing flux and magnetizing field. The output power is 200 VA, the nominal power consumption is 1,000 VA, the harmonic distortion of the magnetization flux or magnetic field intensity curve is no more than 3%, the overall dimensions of the two units together is 480 x 475 x 400 mm and the total weight is 52 kg. Figures 2; references: 4 Russian.

8225/9835
CSO: 1860/323

MULTIPLE CIRCUIT SQUID AS A MAGNETIC INDUCTION METER

Moscow IZMERITELNAYA TEKHNIKA in Russian No 7, Jul 86 pp 43-44

[Article by S.I. Bondarenko, Ye.A. Golovanev, and V.V. Kravchenko]

[Abstract] One- and multiple-circuit SQUID (superconducting quantum interference device) are the most sensitive meters of magnetic induction in the low-frequency band. The present article is concerned with the necessity for a comparison of their basic characteristics and a choice of the optimum construction of induction meters on the basis of SQUID. It is shown that the calculated values of the sensitivity to changes of the magnetic induction and the conversion factor of induction into voltage of a multiple-circuit SQUID with n circuits connected in parallel can be higher than in a one-circuit SQUID and antenna-SQUID converters with equal combined areas permeated by the magnetic flux being measured. Figures 2; references 9: 2 Russian, 6 Western (1 in Russian translation).

6415/9835

CSO: 1860/28

UDC 537.312.62

SUPERCONDUCTING MAGNETIC SYSTEM OF GYROTRON

Moscow IZMERITELNAYA TEKHNIKA in Russian No 7, Jul 86 pp 44-45

[Article by A.Ya. Laptiyenko, N.V. Taryanik, B.A. Levitan, and V.I. Kurochkin]

[Abstract] In order to operate gyrotrons (firm's name for a vibrating gyro) strong magnetic fields are necessary, the induction of which in the millimeter range of wavelengths consists of several Tesla, and the volume to hundreds and thousands of cubic centimeters. Such fields are relatively easy to obtain with the assistance of superconducting magnetic systems which have a number of requirements listed in the article. The superconducting magnetic system of a gyrotron is described which gives rise to a magnetic field with inductions up to 3 Tesla in apertures with a diameter of 180 mm. The irregularity of the magnetic field in a regime of "frozen" magnetic flux is less than $8 \cdot 10^{-9}$ for one hour. Figures 2; references 7: 5 Russian, 2 Western.

6415/9835

CSO: 1860/28

UDC 621.372.852.1

RECTANGULAR WAVEGUIDE H_{10} MODE DIFFRACTION IN ARRAY OF CIRCULAR INDUCTIVE RODS

Moscow RADIOTEKHNIKA in Russian No 4, Aug 86 (manuscript received after revision 18 Aug 85) pp 13-18

[Article by A.M. Model and A.Yu. Savitskiy]

[Abstract] Previous computer-aided design procedures for waveguide bandpass filters using an array of rods in the waveguide window could not produce windows with a susceptance up to 200 and an error of no more than 5%, which means defining the reflection factor within $1 \cdot 10^{-6}$. The best effort resulted in a window with three rods having a susceptance of about 40 with an error of approximately 8%. This paper derives the mathematical tools for the computer-aided solution of H_{10} mode diffraction in a rectangular waveguide by an array of equally spaced, circular inductive rods. The procedure provides for the accurate calculation of the reflection factor from the window where the susceptance can run up to 300 (the divergence between the calculated and experimental values is about 5% for a susceptance of 150 and 14% for a value of 300 using a FORTRAN program on a YeS computer. Increasing the number of line currents in each rod up to 20 reduced the disparity to 5% for a susceptance of 300. Figures 3; references 9: 7 Russian, 2 Western.

8225/9835

CSO: 1860/270

MILLIMETER BAND FERRITE ISOLATOR USING REFLECTIVE DIELECTRIC WAVEGUIDE

Moscow RADIOTEKHNIKA in Russian No 4, Apr 86 (manuscript received 19 Nov 85)
pp 84-85

[Article by S.S. Gigoyan and B.A. Murmuzhev]

[Abstract] Nonreciprocal effects in electromagnetically coupled semiconductor and axially magnetized dielectric waveguide ferrites are studied experimentally at frequencies of 55 to 80 GHz in the case when the dielectric permittivities of the semiconductor material and the ferrite are approximately the same. The isolator structure contains a reflective dielectric waveguide made of GaAs with a resistivity of more than $10^7 \text{ ohm}^{-1}\text{cm}^{-1}$ or polykor, having a cross-section of $0.5 \times 0.5 \text{ mm}$ and a length of 40 mm. The type 10Sch6B ferrite waveguide was fitted against the side surface of the GaAs or polykor waveguide and glued together with it to the surface of a polished brass substrate. The influence of the direction of the magnetizing field, the length and cross-section of the ferrite dielectric waveguide and the gap between the ferrite and the semiconductor waveguide as well as the impact of the dielectric permittivity of the waveguide on the input SWR, initial losses and isolator decoupling were measured. The maximum isolation occurs with strictly defined values of the cross-section and length of the ferrite dielectric waveguides. The isolation is plotted as a function of frequency between 60 and 80 GHz, showing that the GaAs waveguide has considerably greater bandwidth and isolation. The authors are grateful to Ye.F. Ushatkin for measuring the parameters of the dielectrics and ferrites used in the work. Figures 4; references 5: 1 Russian, 4 Western.

8225/9835
CSO: 1860/270

UDC 621.372.852; 621.372.828

MAGNETIC LOSSES IN PERMALLOY FILMS IN SUBRESONANT REGION OF FERROMAGNETIC RESONANCE

Moscow MIKROELEKTRONIKA in Russian Vol 15, No 5, Sep-Oct 86
(manuscript received 8 Jan 86) pp 469-471

[Article by A.M. Morozov and V.Ya. Sysoyev, All-Union Correspondence Engineering-Construction Institute]

[Abstract] The effect of the microwave frequency amplitude on the magnetic losses in permalloy films in the preresonant region was experimentally investigated. It is shown that the magnetic losses are increased with growth of the microwave frequency field, during which it is possible to

regulate the magnitudes of the losses by a magnetic field oriented parallel to the microwave field. By this means the occurrence of magnetic losses in films is connected with the effect of longitudinal pumping. The magnitudes of the losses were measured by the large voltage standing wave ratio method. The amplitude of the microwave field was measured from 0 to 500 A/m. The investigation was conducted by a unit which included a microwave generator, a circulator, a measuring line, a short-circuited strip line with a thin magnetic film, a microwave power meter, and an instrument amplifier. Lines were used with a wave resistance of 50 ohm, the width and thickness of the strip conductor amounted to 3 and 0.05 millimeter, respectively, and the distance between the strip and the ground base - 0.6 mm. A diagram of magnetic films interacting with a thin magnetic strip is presented. Figures 3; references: 8 Russian.

6415/9835

CSO: 1860/17

UDC 621.385.624.017.8.027.89

MULTIPLE-RESONATOR EFFICIENCY-OPTIMIZED RELATIVISTIC KLYSTRONS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian Vol 31, No 7, Jul 86
(manuscript received 19 Mar 84) pp 1368-1374

[Article by A.V. Aksenchik, S.V. Kolosov, A.A. Kurayev, and B.M. Paramonov]

[Abstract] A study is made of the problem of optimization of relativistic multiple-resonator klystrons using the univariate nonlinear model of the interaction process. This relatively simple model allows the basic physical regularities involved to be traced. Optimized of design can achieve an efficiency of over 80-90% while retaining gain at near 50-60 dB for megavolt accelerating voltages. Figure 1; references: 12 Russian.

6508/9835

CSO: 1860/9

UDC 621.313.333-213.34

VAO2 SERIES OF HIGH VOLTAGE EXPLOSION-PROOF ASYNCHRONOUS MOTORS

Moscow ELEKTROTEKHNIKA in Russian No 7, Jul 86 (manuscript received 25 Sep 85)
pp 19-22

[Article by V.F. Goryagin, L.A. Zbarskiy, I.G. Shirnin, candidates of technical sciences, Yu.V. Porshnev and M.I. Figotina, engineers]

[Abstract] The VAO2 asynchronous, squirrel cage, explosion-proof electric motors have the same power and r.p.m. range, the same weather, water and dust-proofing as the predecessor VAO series and are designed for the same explosion hazards. The nominal r.p.m. ranges from 750 to 3,000, the power ratings from 200 to 1,000 kW, voltage ratings are 6,000 and 10,000 volts with efficiencies running from 93.4 to 95.6% and weights of 1,620 to 5,700 kg. The new VAO2 motors incorporate the following improvements: the use of cold-rolled electrical steel (type 2412) with lower specific losses; the use of a bottle configuration for the rotor slot instead of the usual oval; an improved exterior cooling system; a reduction in the average insulation thickness from 0.6 mm to 0.5 mm in the 200 to 500 kW motors by using PETVSD wire. The VAO2 designs show an average weight reduction of 20 to 50% over their earlier VAO counterparts and an improvement in the efficiency of 0.6 to 1.3%; the temperature of the stator windings has been reduced by 10 to 25°C. Drawings show the explosion proofing seals of the bearings and the shock absorber configuration for the bearing assemblies. Detailed specifications of the motors are given in three tables. The VAO2 series were placed in production starting in 1981, resulting in a metal savings of 3,600 t annually. Figures 3; references: 5 Russian.

8225/9835
CSO: 1860/323

WAYS OF DECREASING METAL INPUT REQUIREMENTS AND IMPROVING PARAMETERS OF
EXPLOSION-PROOF ELECTRIC MOTORS

Moscow ELEKTROTEKHNIKA in Russian No 7, Jul 86 (manuscript received 4 May 85)
pp 22-24

[Article by A.S. Ponizko, candidate of technical sciences, All-Union
Scientific Research Institute for Explosion Protected and Mining Electrical
Equipment]

[Abstract] The specific metal input requirements for the construction of explosion-proof electric motors can be reduced by improving the forced-air cooling and relieving the explosion hazardous pressure through the use of gas permeable fire barriers. This paper provides calculated quantitative estimates of the cooling efficiency for explosion-proof, asynchronous motors cooled by a twin blower, mounted on the motor shaft. The internal ventilation inside the explosion-proof containment is accomplished by the inside blower of the fan assembly and the air, being rarefied, is sucked through porous elements from the working end of the shaft, is passed through the rotor channels, through the porous elements of a second bearing shield plate and is directed by the vanes of fan into the air flow coming from the outer forced-air circulating blower. Calculations of the air-flow, temperature and cooling efficiency are given for a four-pole 160 kW VA0315M-4 motor. The performance of the porous fire barriers in dusty environments is also discussed; the use of fine mesh steel screen is seen as the most effective. For quite-running designs of the same size as the VA0315M-4, this internal cooling through porous fire barriers enables a temperature reduction of 20°C and an increase in the power rating per stage as well as a decrease in the material input requirements from 8.86 to 7.3 kg/kW. The weight of the motors can also be reduced by approximately 5 to 10%. Figures 2; references 8: 7 Russian, 1 Western.

8225/9835
CSO: 1860/323

UDC 621.313.13:621.867.6

NEW 2AR SERIES OF ROLLER CONVEYOR MOTORS

Moscow ELEKTROTEKHNIKA in Russian No 7, Jul 86 (manuscript received 23 May 85)
pp 25-26

[Article by S.A. Shelekhov, candidate of technical sciences, L.N. Baranova,
Yu.I. Fedosov, engineers and T.S. Shelekhova, candidate of technical sciences]

[Abstract] A new series of three-phase, asynchronous, squirrel cage motors for service as conveyor roller drivers has been developed at the Sibelektromotor production association. The new 2AR motors retain the basic technical

specifications of the AR series; the new design conforms to International Electrotechnical Commission Recommendations and the shafts and bearing assemblies have been strengthened. The motors can be specified for 50 or 60 Hz operation as well as standard voltages of from 220 to 660 VAC. An extensive table details the starting, continuous duty, start-stop service and other parameters for 40 different motors in the 2AR series. The nominal power ratings run from 0.90 to 10 kW; the efficiencies from 47 to 80% and the speeds from 275 to 1,245 r.p.m. Tables 1; references: 2 Russian.

8225/9835
CSO: 1860/323

UDC 66.011:658.511.003.12

THERMOECONOMIC ANALYSIS AND OPTIMIZATION OF MULTIPURPOSE ELECTRICAL-ENGINEERING SYSTEMS

Moscow PROMYSHLENNAYA ENERGETIKA in Russian No 9, Sep 86 pp 2-7

[Article by A.M. Gorlenko, candidate of technical sciences, All-Union Scientific Research and Planning Institute, Power Engineering Industry]

[Abstract] A method is described, developed for thermoeconomic analysis and optimization during solution of the problem of reducing power consumption. The method makes it possible to determine the cost of all production lines, including special-purpose products (with allowance made for thermodynamic perfection of the system and the economic expenditures on their production), supply of secondary power resources, and the optimum level of their regeneration. In addition, this method makes it possible to determine flows of secondary heat, the recuperation of which is both thermodynamically and economically justified, and which is impossible to accomplish during optimization on the basis of economic indices alone. Figures 4; references 2: 1 Russian, 1 Western.

6415/9835
CSO: 1860/37

COMPLEX APPROACH TO PLANNING POWER EFFICIENCY OF NEW TECHNIQUES

Moscow PROMYSHLENNAYA ENERGETIKA in Russian No 9, Sep 86 pp 7-10

[Article by L.G. Gayev, candidate of economic sciences, Yu.B. Klyuev, doctor of economic sciences, Ural Polytechnical Institute imeni S.M. Kirova; and R.B. Garifov, engineer, Ural Electrical Heavy Machinery Production Association]

[Abstract] The theoretical and methodological bases are considered of the complex evaluation of power economy to be developed at early stages of the design of new techniques. (A figure of the indices involved is presented.) A 3-stage method is proposed for determining an economic solution during the selection of a power efficient version of the new techniques. A 19-step flowchart is shown of an algorithm used for planning power saving during the introduction of new techniques. Figures 2; references: 2 Russian.

6415/9835
CSO: 1860/37

SENSORS IN SYSTEMS OF AUTOMATIC CONTROL OF ELECTRIC DRIVES

Moscow PROMYSHLENNAYA ENERGETIKA in Russian No 9, Sep 86 pp 13-18

[Article by B.R. Gendelman, candidate of technical sciences; A.S. Fedotov, Yu.I. Vigdorchik, engineers. All-Union Scientific-Research, Planning and Design Institute for Automatic Electric Drive in Industry, Agriculture, and Transportation]

[Abstract] The principal characteristics of various types of electrical sensors employed in USSR systems of automatic control of electric drives are presented. Circuits for the following units are presented: 1) Type RG-5AI current and voltage sensor; 2) Single-phase design sensor for selection of active and reactive components of current in 3-phase alternating-current circuit; and 3) 3-phase design sensor for selection of active and reactive components of current in 3-phase alternating current circuit. A mechanical diagram is shown of the PDF pulse photoelectric sensor. Figures 5; references: 4 Russian.

6415/9835
CSO: 1860/37

CONTROL OF ELECTRICAL CONSUMPTION OF OIL FIELDS

Moscow PROMYSHLENNAYA ENERGETIKA in Russian No 9, Sep 86 pp 18-21

[Article by Yu.B. Novoselob, V.P. Frayshteter, candidate of technical sciences, I.A. Nissenbaum, engineer, Tyumen State Design Institute for Oil and Gas Industry imeni V.I. Muravlenko; V.S. Myakinin, engineer, Tyuman Main Administration for Oil and Gas Industry]

[Abstract] The processes of oil extraction along with contemporary methods of intense exploitation of oil deposits are characterized by significant expenditures of electrical energy. For these processes there are inherent uniform graphs of the electrical load during the course of 24 hours. Nevertheless the graphs of the power system on the whole (e.g., Tyumen Power) obviously have distinct morning and evening peaks, determined by the rest of the load. Consequently, balancing of the 24-hour graph of the electrical load, assuring a more efficient use of energy resources and installed production power in the fields, leading to a considerable national-economic effect is an urgent problem for such districts, and in particular for the Tyumen Power System. The article gives a basis for the possibility and advisability of using group pumping stations for control of the electrical consumption of oil fields. The effect is achieved not only by a reduction of the load in hours of the peak power systems, but also as the result of utilizing pump units with optimum power characteristics. The results of industrial tests are presented. References: 3 Russian.

6415/9835

CSO: 1860/37

NORM SETTING FOR THE RELIABILITY OF THE ELECTRIC POWER SUPPLY OF ENTERPRISES IN PETROLEUM CHEMISTRY COMPLEXES

Moscow PROMYSHLENNAYA ENERGETIKA in Russian No 9, Sep 86 pp 21-22

[Article by V.I. Starostin, doctor of technical sciences, Omsk Polytechnical Institute]

[Abstract] The normed reliability indices of the electric power supply are determined for a petroleum refining enterprise. An analysis of the norms obtained for the reliability indices show that at the highest reliability level, the norm setting of the disconnection frequency proved in a number of cases to be larger than at a lower level. Such a result is natural and is explained by a specific method which takes into account the disadvantages for installations which have a different frequency (depending on requirements) of the disconnection. The normed reliability indices must be reviewed

periodically with allowance made for the dynamics of a change of the reliability of the electric power supply system. It is advisable to introduce into the bonus system, payment of electrical-engineering personnel for attainment and maintenance of normal reliability indices. Employment of normed reliability indices for power supply sources assumes the establishment of differentiated rates of payment for electric power, as a function of the degree of reliability at the busbars of the power supply sources as stated by consumers. It is necessary to consider the development of normed reliabilities of the power supply source as a problem of optimizing the decisions made at all levels of the hierarchy of the electric power system--from the sources of power supply as far as the busbars of the electrical supply of a production unit. Figures 2; references: 6 Russian.

6415/9835
CSO: 1860/37

UDC 621.31-213.34.019.3

ELECTRICAL EQUIPMENT POTTED BY COMPOUNDS AND SEALANTS

Moscow PROMYSHLENNAYA ENERGETIKA in Russian No 9, Sep 86 pp 23-25

[Article by N.A. Boykov, candidate of technical sciences; V.V. Kudin and A.V. Panasyuk, engineers. All-Union Scientific-Research Institute of Explosive Protected Electrical Equipment]

[Abstract] Potting of current-carrying parts of electrical equipment by compounds and sealants is one of the methods of assuring their explosion protection. On the one hand potting materials are a means of electrical insulation, and on the other prevent contact with surrounding dangerously explosive or aggressive environment. Various forms of electrical equipment are considered and recommendations made with respect to potting material and the constructional realization of explosion protection. Figures 6; references: 2 Russian.

6415/9835
CSO: 1860/37

CONCERNING CHOICE OF METHODS OF COUNTER-EMERGENCY CONTROL OF ELECTRIC POWER SYSTEM

Moscow ELEKTRICHESTVO in Russian No 7, Jul 86 pp 8-14

[Article by T.V. Vaskova and B.I. Iofyev]

[Abstract] The effectiveness is compared of various control actions intended to maintain the stability of electric power systems during a reduction of one of the emergency communications and at the beginning of an emergency power shortage at one of the nodes. The standard for comparison is the relative damage from the interruption of electrical supply and stepping down of the frequency. It is shown that the control actions in a three-node circuit are much smaller than in a two-node. A significant dependence is shown of the relative damage on the method of construction of the counter-emergency automatic equipment. The following items in the article are considered in relative detail: 1) Two-node circuit and reduction of communications in it; 2) Deficiency of power in receiving unit of two-node circuit; 3) Emergency deficiency of power in three-node circuit; and 4) Average annual damage. Figures 4; references: 10 Russian.

6415/9835
CSO: 1860/26

ECONOMIC ELECTRIC CURRENT DENSITY OF CABLE WITH INTENSIVE COOLING OF THE CURRENT CONDUCTORS

Moscow ELEKTRICHESTVO in Russian No 7, Jul 86 (manuscript received 12 Mar 85) pp 19-21

[Article by A.V. Berezchnoy, candidate of technical sciences, Belorussian Polytechnical Institute]

[Abstract] A method is proposed for calculation of the economic density of the current (EDC) of cable lines with forced cooling of the current conductors, and the factors which substantially influence of the EDC magnitude are described and evaluated. As an example, in cryogenic cable lines with copper current conductors, the EDC is higher than in the case of lines with aluminum current conductors. However, if the current phases of the cable are made of ultra-pure aluminum, then at water temperatures this difference is smoothed out. It is shown that the EDC of such cryogenic cable lines is higher than is the case for traditional aerial and cable lines, and as a function of the operating conditions of the cooling medium it can be found in the limits 2-38 A/mm². References: 5 Russian.

6415/9835
CSO: 1860/26

PRINCIPAL DIRECTIONS FOR DEVELOPMENT AND INVESTIGATION OF CRYOMOTOR WITH
10 MW POWER

Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 86 pp 30-33

[Article by N.G. Grinchenko, engineer; V.G. Danko, doctor of technical sciences; V.S. Kildishev, V.I. Milykh, and N.F. Ozernoy, candidates of technical sciences; and R.I. Treteovich, engineer]

[Abstract] The prerequisites for the creation of a large power cryomotor based on the construction of a direct current multipolar machine are considered. A summary analysis is made of theoretical and experimental investigations under way. The complex of investigations conducted make it possible to accept final design solutions and to proceed to the stage of an experimental-industrial investigation of a cryomotor with superconducting excitation. Figures 4; references 16: 14 Russian, 2 Western.

6415/9835
CSO: 1860/27

UDC 621.316.54.002: [669.22 + 609.27].004.8

METHODS OF SAVING SILVER AND TUNGSTEN DURING PRODUCTION OF SWITCHING
APPARATUS

Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 86 pp 33-35

[Article by A.I. Trepalin, Ya.A. Gluskin, candidates of technical sciences; K.A. Gamygin, engineer]

[Abstract] The principal results are examined of work conducted in industrially developed countries, directed to saving silver and tungsten during production and use of electric contacts in switching apparatus. It is shown that economy of sharply-deficient materials can be achieved both through the development of new materials with a reduced content of such materials, as well as improvement in the use of contacts. At present the most radical measure with respect to saving silver in switching apparatus--its complete replacement--seems to be possible only in combination with the development of new apparatus designs and new circuit diagrams. Development of the following items is considered: 1) Vacuum arc-suppression chambers and contact materials from them; 2) Designs of apparatus which assures operation of contacts in an oxygen-free atmosphere; and 3) Hybrid apparatus where the electrical contacts in the switching process are shunted by semiconductor devices. References 16: 10 Russian, 6 Western.

6415/9835
CSO: 1860/27

GENERALIZED CHARACTERISTIC OF TUBULAR LIQUID RHEOSTAT

Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 86 (manuscript received 13 Mar 85)
pp 35-37

[Article by I.I. Leyfman, candidate of technical sciences, Horizon Design Office]

[Abstract] During tests of electrical devices, the necessity appears for the use of resistances dispersing large power. One of the possible versions is a tubular liquid rheostat (TLR), which is described. A generalized equation is obtained for calculation of the volt-ampere characteristic of a TLR with forced pumping of liquid by direct and alternating current with the use of characteristic scales for current and voltage. The calculation satisfactorily agrees with experiment. Figures 2; references: 1 Russian.

6415/9835
CSO: 1860/27

INCREASE OF STABILITY OF LIQUID-METAL SELF-RESTORING SAFETY DEVICE

Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 86 (manuscript received 8 Aug 85)
pp 40-42

[Article by A.V. Kuznetsov, engineer, Ulyanovsk Polytechnical Institute]

[Abstract] Technical solutions are considered, directed to an increase of the stability of the protective characteristic of liquid-metal self-restoring safety devices (LMSD). It is shown that: 1) A significant deficiency of the LMSD is the instability of the protective characteristic caused by an increase of the diameter of the dielectric bushing channel as the result of arc erosion. This limits the range of application of the LMSD; 2) Stabilization of the characteristic through shunting of the LMSD by a resistor requires a considerable reduction of its resistance, which reduces the current-limiting action of such a device; 3) With an arrangement in the narrowed part of the dielectric bushing channel of the LMSD high-melting-point electrode, it is possible to obtain a stable protective characteristic without a reduction of the resistance of the shunting resistor and the current-limiting properties of the device; 4) The technical solution proposed does not have analogs in universal practice and makes it possible to employ LMSD not only as current limiters for an increase of the switching-off ability of electrical equipment, but also for protection of electrical supply systems from overloads and short circuits; and 5) The results of the investigation conducted can be used during the development in the USSR of industrial models of the LMSD. Figures 3; references 4: 3 Russian, 1 Western.

6415/9835
CSO: 1860/27

MECHANICAL CHARACTERISTICS OF SYNCHRONOUS MOTOR WITH WASTE-FREE TECHNOLOGICAL PROCESS

Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 86 p 56

[Article by R.I. Talyshchinskiy and V.F. Davydov, candidates of technical sciences, and F.M. Aliyev, T.S. Rogozinskaya, engineers, All-Union Scientific Research and Design Institute for Electric Machine Building Technology]

[Abstract] A comparative analysis is made of the control characteristics of motors with a waste-free technological process (WFTP) of the off-the-shelf magnetic core stator, and the advantage is revealed of a motor with a WFTP magnetic core stator. Oscillograms are presented of the start-up of the motors tested. Figures 2.

6415/9835

CSO: 1860/27

PHOTON FIELD-EFFECT TRANSISTORS BASED ON GALLIUM-ARSENIDE AND ITS SOLID SOLUTIONS

Moscow MIKROELEKTRONIKA in Russian Vol 15, No 5, Sep-Oct 86
(manuscript received 22 Jul 85) pp 464-466

[Article by Yu.M. Zadiranov, V.I. Korolkov, A.V. Rozhkov, and
V.V. Russu, Physico-Technical Institute, Academy of Sciences USSR.

[Abstract] The results are presented of an investigation of the principal characteristics of photon field-effect transistors based on GaAs and solid solutions of AlGaAs, a schematic representation of which is shown. The basic difference between a photon field-effect transistor and similar devices is the presence of optical connection between components of its elements. As a result of excluding the diffusion process for transferring minority charge carriers from the site of their injection to the site of separation by the collector p-n junction, the changeover time can be reduced to 10^{-8} - 10^{-9} second. The zonal energy diagram selected and the technological preparation assure internal positive connection and make it possible to obtain devices with various kinds of volt-ampere characteristics. The authors thank Zh.I. Alferov for interest and attention to the work. Figures 3; references 7: 4 Russian, 3 Western.

6415/9835
CSO: 1860/17

SOLID STATE CIRCUITS

UDC 621.382:8.002

GENERALIZED NUMERICAL MODEL OF PROCESSES OF DRY LOCAL ETCHING AND VACUUM AND GAS PHASE DEPOSITION OF MATERIALS ON A RAISED SURFACE

Moscow MIKROELEKTRONIKA in Russian Vol 15, No 5, Sep-Oct 86
(manuscript received 5 Jan 86) pp 387-391

[Article by V.A. Kunilov and I.V. Sayapin]

[Abstract] A generalized numerical model of the processes of dry local etching and vacuum and gas phase deposition of materials on a raised surface is described, taking into account the effect of the reflection of chemically active particles and particles of deposited material from the surface on the form of the profiles of etching and deposition. The choice of the method and the calculated parameters used during solution of the equation concerned with distribution of the density of the flow along the line of the modulated profile are substantiated. In a number of cases the effect is observed of an increase of the rate of side etching during transition from one functional layer to another. It is shown that the effect of reflection of particles from the surface can be used for control of the quality of coverage of the raised surface, together with the effect of the surface migration. The model described can be used during analysis and optimization of appropriate technological processes. Figures 5; references 6: 4 Russian, 2 Western.

6415/9835
CSO; 1860/17

UDC 621.382

KINETICS OF PROCESS OF NONRESISTIVE ION-BEAM LITHOGRAPHY

Moscow MIKROELEKTRONIKA in Russian Vol 15, No 5, Sep-Oct 86
(manuscript received 25 Jan 86) pp 392-397

[Article by K.A. Valiyev, T.M. Makhviladze, and A.V. Rakov, Institute of General Physics, Academy of Sciences USSR]

[Abstract] Irradiation by ions with average energies of nonorganic solid-state materials (e.g., monocrystalline silicon, and SiO₂ and Si₃N₄ films)

leads to a noticeable increase of the rate of their liquid etching. This effect makes it possible in principle to develop for the production of microelectronic items a process of ion lithography of submicron resolution without use of auxiliary resistive layers. In the present article a model is proposed for nonresistive ion-beam lithography of nonorganic solid state materials with liquid etching. The model developed is used for interpretation of experiments concerned with etching of ion-irradiated silicon dioxide thermal films. In the model the Arrhenius connection of the rate of etching with the energy of activity of the process of development of a latent image can be used to describe different forms of lithographic processes, using other sources of radiation and methods of display. Figures 3; references 9: 4 Russian, 5 Western.

6415/9835

CSO: 1860/17

UDC 681.325;681.328.66

METHODS OF INCREASING SPEED OF RESPONSE OF PRECISION INTEGRATED ANALOG-TO-DIGITAL CONVERTERS OF DIGIT-BY-DIGIT BALANCING

Moscow MIKROELEKTRONIKA in Russian Vol 15, No 5, Sep-Oct 86
(manuscript received 16 Sep 86) pp 431-433

[Article by A.Yu. Pogosov and D.Ye. Polonnikov, Institute of Control Problems, Academy of Sciences USSR]

[Abstract] The possibilities are examined of increasing the speed of response of precision (14-18 bits) integrated analog-to-digital converters of digit-by-digit balancing by means of a reduction of the rise time of the voltage in the input circuit of the comparator. Calculated relations and experimental data are presented concerned with an evaluation of the gain from bypassing the input of the voltage comparator, and from use of a current comparator with the object of protection from overload of the input current by tunnel diodes. The comparators considered are completely suitable for construction of 16-bit integrated analog-to-digital digit-by-digit balancing, and permit production by hybrid technology. A farther increase of resolution is limited by the noise of the comparator units and the digit-by-digit converter, and apparently may be obtained at the cost of a loss in the speed of response of the analog-to-digital converter. Figures 4; references 6: 3 Russian, 3 Western.

6415/9835

CSO: 1860/17

NEW ACTIVITIES, MISCELLANEOUS

UDC 621.921.46

CARDBOARD SHREDDER

Moscow ELEKTROTEKHNIKA in Russian No 8, Aug 86 p 57

[Article by O.V. Aristov, engineer, Mayli-Say Electric Lamp Plant
imeni 50 Years of the USSR]

[Abstract] An illustration and a table of technical data are used to describe a cardboard shredder produced at the Mayli-Say Electric Lamp Plant for enterprises of the electrical-engineering industry. The annual economic effect from the introduction of one unit into the plant amounts to 2 thousand rubles. Figures 1.

6415/9835

CSO: 1860/27

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